

INTEGRATED CARE FOR DIABETES AND EYE HEALTH

A GLOBAL COMPENDIUM OF GOOD PRACTICE



The Fred Hollows
Foundation



Helen Keller
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of OPHTHALMOLOGY



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Acknowledgement



Hospital screening for DR in the Pilbara region of Western Australia. Photo: Alan McDonald

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The initiative is a multi-agency advocacy project being undertaken by leading non-government agencies in the diabetes and eye health sectors from 2017-2018. The current Leadership Group for the initiative includes: The Fred Hollows Foundation; Helen Keller International; The International Agency for the Prevention of Blindness; International Council of Ophthalmology; International Diabetes Federation; Lions Clubs International Foundation; Orbis International; Sightsavers International; The Queen Elizabeth Diamond Jubilee Trust; World Council of Optometry; and in association with the World Health Organisation.

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The compendium was written and compiled by The Fred Hollows Foundation. For more information please contact the Global Partnerships and Advocacy Division, The Fred Hollows Foundation fhf@hollows.org

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Disclaimer:

Case studies presented in this compendium were selected following an international call for expressions of interest and reflect an intention to provide readers with brief examples of programs from a broad range of contexts. Inclusion of individual case studies in this compendium does not reflect endorsement by the initiative or individual partners on the validity or efficacy of works either in part or as a whole nor should it be read as a statement on the success or otherwise of each program in achieving health outcomes.

ACRONYMS

Frequently used acronyms throughout the Compendium

DR	Diabetic Retinopathy
DR-NET	Diabetic Retinopathy Network
DM	Diabetes Mellitus
DME	Diabetic Macular Edema
GP	General Practitioner
IDF	International Diabetes Federation
LMIC	Low to middle income country
MoH	Ministry of Health (relative to specific country)
NCD	Non-Communicable Disease
PHC	Primary Health Centre
PWD	People with diabetes
STDR	Sight Threatening Diabetic Retinopathy
WHO	World Health Organisation

Why this report

As global awareness of Diabetic Retinopathy (DR) has increased so too has the development of resources and tools to assist health care providers in the early detection and treatment of this growing public health problem associated with the rising prevalence of diabetes. However, few of these resources have focused on providing insight into innovative approaches to integrating eye health with diabetes management and control, across the health care spectrum.

For this reason the 'Integrated care for diabetes and eye health: A global compendium of good practice' has been developed. It documents a series of 'real-world' case studies that showcase current initiatives to advance integrated care for DR across the spectrum of health promotion, prevention, early intervention and treatment in a range of different contexts and resource settings.

The compendium has been designed to help fill a crucial knowledge gap and to strengthen the existing evidence base through providing insights on a range of different models, lessons learned and key recommendations on how to effectively implement integrated care.

Drawing on evidence from a range of projects and programs showing promising results from 17 countries, the document will provide guidance to policy makers, medical organisations, service providers and social investors.

The intended outcome is that decision makers and practitioners will be able to build on the findings and learnings presented in this report to implement their own strategic and tactical approaches to addressing the challenges of blindness and vision loss from diabetes. Ultimately, it is our hope that those living with or at risk of DR around the world will be able to access the support they need, when and where they need it.

High Level Summary

All seventeen case studies presented in this compendium have been mapped against integration type. Many of these case studies reflect multiple approaches to integration articulated within this report.

CASE STUDY	COUNTRY	REGION	PRIMARY INTEGRATION TYPE	SUBMITTING ORGANISATION(S)
Evidence-based leaflet to promote uptake of retinal screening among young adults	Australia	East Asia & Pacific	Integration of eye care into routine diabetes care/primary care	The Australian Centre for Behavioural Research in Diabetes
Preventing Blindness from Diabetic Retinopathy and Other Diabetes-Related Eye Diseases	Armenia	Europe & Central Asia	Horizontal and vertical integration of services	Armenian EyeCare Project
Comprehensive, integrated diabetes care for children	Bangladesh	South Asia	Integration of eye care into routine diabetes care/primary care	Orbis International
A successful integration of DR into comprehensive, county-level eye care in rural China	China	East Asia & Pacific	Integration of diabetes care into comprehensive/primary eye care	Orbis International
Reduction in Blindness in the County of Gloucestershire	England	Europe & Central Asia	Integration of diabetes care into comprehensive/primary eye care	Gloucestershire Diabetic Eye Screening Programme
Diabetes eye care awareness training for primary level clinicians	Fiji	East Asia & Pacific	Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines	The Fred Hollows Foundation (NZ) & Pacific Eye Institute
Integrated Models of Care for Diabetic Retinopathy	India	South Asia	Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines	International Centre for Eye Health, London School for Hygiene and Tropical Medicine & Indian Institute of Public Health, Public Health Foundation of India
Addressing Diabetic Retinopathy	Indonesia	East Asia & Pacific	Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines	Helen Keller International
Modelling a Telemedicine Screening Program for Diabetic Retinopathy and Implementing a Pilot Project	Iran	Middle East & North Africa	Horizontal and vertical integration of services	Ophthalmic Research Center, Shahid Beheshti University of Medical Sciences
Screening for Diabetic Retinopathy, Telemedicine: Pilot Project	Mexico	Latin America & Caribbean	Integration of eye care into routine diabetes care/primary care	Instituto Mexicano de Oftalmología, IMO, Querétaro (Mexican Institute of Ophthalmology)
Integrated Approaches to Address Diabetic Retinopathy in three Districts	Pakistan	South Asia	Horizontal and vertical integration of services	Sightsavers
Comprehensive Model of Diabetic retinopathy Management	Palestinian Territories	Middle East & North Africa	Integration of eye care into routine diabetes care/primary care	St. John Eye Hospital Group
Implementing an Integrated Diabetic Retinopathy Health System Model	Peru	Latin America & Caribbean	Integration of eye care into routine diabetes care/primary care	Orbis International
Evidence-Based Shared Care Eye Model: Right Siting Of Stable Diabetic Retinopathy Patients To Primary Eye Clinic	Singapore	East Asia & Pacific	Integration of diabetes care into comprehensive/primary eye care	Singapore National Eye Centre Singapore Eye Research Institute Duke-NUS Graduate Medical School
Upscaling of diabetic retinopathy screening	Tanzania	Sub-Saharan Africa	Integration of eye care into routine diabetes care/primary care	London School of Hygiene & Tropical Medicine
Diabetic eye health care model of integration at the inter and intra-professional levels at a community health center	USA	North America	Horizontal and vertical integration of services	Lynn Community Health Centre & The New England College of Optometry
Diabetic retinopathy screening and treatment	Zambia	Sub-Saharan Africa	Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines	Frimley Park Hospital (UK)

Introduction

Diabetic eye disease refers to a group of conditions affecting the structure or function of the eye, and are associated with or result as complications of long-standing diabetes. These include cataract, glaucoma, refractive error and loss of focussing ability (accommodation), nerve involvement such as ischemic optic neuropathy and ocular nerve palsies resulting in double vision but most importantly, diabetic retinopathy (DR), which includes diabetic macular edema (DME) and proliferative diabetic retinopathy¹.

Diabetic retinal disease or DR occurs as a direct result of chronic hyperglycaemia causing damage to the retinal capillaries, leading to capillary leakage and capillary blockage. It may lead to loss of vision and eventually blindness. When such damage occur in the macula region, DME occurs, the most common cause of vision loss in persons with diabetes.

DR already affects an estimated one third of all people with diabetes (PWD) and is the leading cause of vision loss in working-age adults.² In fact, every person with diabetes is at risk of developing DR and all will potentially have it – if they live long enough.

As the incidence of diabetes increases exponentially worldwide, so too will the number of people living with its complications including DR. At any one time, one third of people with diabetes will have DR and about one third of them, 8-10% of all, will have sight-threatening DR requiring treatment. Predictions suggest that by 2040, 642 million adults will be living with diabetes, 224 million will have some form of DR and 70 million will have vision threatening DR³. However, with appropriately timed treatment up to 98% of blindness from DR can be prevented. Given the rising incidence of this largely avoidable cause of vision loss⁴, there must be a focus on addressing DR by the international eye health and diabetes care communities.

In order to address this escalating epidemic, a coordinated and collaborative response is required so that prevention, early detection and timely treatment of DR becomes an integral part of the ongoing primary care of PWD, and that well-defined and effective referral pathways to specialist care are established for those who need further examination and treatment are accessible, affordable and of good quality.

Too frequently, however, eye health care remains outside of routine diabetes care and is left to eye health specialists who are often difficult to access. Many PWD do not undergo regular eye examinations because they, as well as many health professionals, are unaware that diabetes can cause vision loss and irreversible blindness. Limited awareness, combined with financial and geographical barriers to access needed services, and uneven distribution of skilled personnel, lack of medical devices and technology for the available personnel to use, all impede access to vital sight-saving services, particularly for people in rural and remote areas.

With only 233,000 ophthalmologists worldwide, it would be impossible for them to perform annual eye examinations that are required as a routine to detect those at risk of vision loss and in need of treatment⁵. A "business as usual" approach cannot prevail. We must go beyond doing more of the same isolated interventions and instead create a collective approach to address the burden of need and improve eye health outcomes for PWD.

An integrated approach to quality comprehensive eye care across eye health and diabetes is needed and will significantly reduce the incidence and burden of vision loss from DR, by ensuring services; support and information are available and accessible for all PWD. Integration is by no means the singular solution to overcoming the increase in DR rates globally, but it will play an important role in reversing the trend.

¹ Wong, T. Y., Cheung, C. M. G., Larsen, M., Sharma, S., & Simó, R. (2016). Diabetic retinopathy. *Nature Reviews Disease Primers*, 2, 16012. doi:10.1038/nrdp.2016.12
² Yau JW et al. Global prevalence and major risk factors of diabetic retinopathy. *Diabetes Care*. 2012 Mar; 35(3):556-64.
³ Kourgiolis, N, Helen Keller International, Diabetic Retinopathy – silently blinding millions of people world-wides, accessed from IAPB Vision atlas, <http://atlas.iapb.org/vision-trends/diabetic-retinopathy/>
⁴ Sabanayagam, C., & Cheng, C.-Y. (2017). Global causes of vision loss in 2015: are we on track to achieve the Vision 2020 target? *The Lancet Global Health*, 5(12), e1164–e1165. doi:10.1016/s2214-109x(17)30412-6
⁵ Taylor, Hugh, R, AC, Immediate Past President, International Council for Ophthalmology.



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Integration

What do we mean and what does it look like?

Fully integrated care for diabetes and eye health will require significant strategic and operational changes to existing healthcare systems, in order to create sustainable care solutions that will reduce the incidence of vision loss attributed to DR globally in the long term⁷.

Integrated care – at its core – will require a coordinated approach across diabetes, primary⁸, secondary and tertiary⁹ health care providers within the disciplines of general diabetes care and eye-health, to jointly address the complications of DR. It will require those responsible for the provision of care at each level of the health care system to take ownership of the services they provide to address DR while supporting other points of care to do the same, ensuring continuity along the care pathway. Doing so will ensure that all PWD and/or DR will be able to access the required services when and where they need them, in the most efficient and effective manner across the healthcare

system. Truly integrated care will seek to create clear pathways from health promotion to disease prevention, from identification of DR to management and from treatment to rehabilitation, for both beneficiaries and service providers alike.

Beyond provision of care at the frontline, integration of DR into related healthcare policy is of critical importance to ensure that appropriate resources, standards and guidelines are established¹⁰. Such an approach will create an operating framework for health care providers to work within, in order to appropriately respond to the complications of diabetes in a coordinated manner.

The case studies included in this compendium showcase a range of approaches to effectively bring together and align management of diabetes with eye health care, in order to ensure that the needs of those living with or at risk of DR are met.

“While no single actor will be able to effect all these changes, an integrated approach whereby different actors work together to achieve their part will have a demonstrable effect on the quality of health care services around the world.”⁶

⁶ Delivering quality health services: a global imperative for universal health coverage. Geneva: World Health Organization, Organisation for Economic Co-operation and Development, and The World Bank; 2018.

⁷ Planning and developing services for diabetic retinopathy in Sub-Saharan Africa, Sophie Poore, Allen Foster, Marcia Zondervan, Karl Blanchet Int J Health Policy Manag. 2015 Jan; 4(1): 19–28. Published online 2014 Dec 16. doi: 10.1517/ijhpm.2015.04

⁸ Primary healthcare denotes the first level of contact between individuals and families with the health system. According to Alma Ata Declaration of 1978, Primary Health Care was based within and served the community; it included care for mother and child which included family planning, immunization, prevention of locally endemic diseases, treatment of common diseases or injuries, provision of essential facilities, health education, provision of food and nutrition and adequate supply of safe drinking water.

⁹ Secondary Healthcare refers to a second tier of health system, in which patients from primary health care are referred to specialists in higher hospitals for treatment. Tertiary Health care refers to a third level of health system, in which specialized consultative care is provided usually on referral from primary and secondary medical care. Specialised Intensive Care Units, advanced diagnostic support services and specialized medical personnel on the key features of tertiary health care.

¹⁰ Wang, L. Z., Cheung, C. Y., Tapp, R. J., Hamzah, H., Tan, G., Ting, D., ... Wong, T. Y. (2017). Availability and variability in guidelines on diabetic retinopathy screening in Asian countries. British Journal of Ophthalmology, 101(10), 1352–1360. doi:10.1136/bjophthalmol-2016-310002

Four broad categories of integrated care have been identified and are outlined below. They are by no means an exhaustive list, but rather serve to demonstrate that "integrated DR care" can involve a range of approaches and strategies to create an integrated diabetes and eye health ecosystem.

1 INTEGRATION OF EYE CARE INTO ROUTINE DIABETES CARE/PRIMARY CARE

a. Training for primary health (e.g., general practitioners) and diabetes care professionals (e.g., endocrinologists) on how to educate and raise awareness of DR with patients and how to properly identify DR, advise patients on appropriate management strategies, and refer patients for treatment.

b. Provision of regular eye health examinations/screening as part of routine diabetes care by service providers

c. Service providers ensuring that patients detected to have DR are guided to access specialist eye services for timely treatment and follow up.

d. Making effective use of available resources at lower levels of the health care spectrum to encourage preventative behaviour, and reduce the unnecessary escalation of DR treatment to secondary and tertiary care levels

2 INTEGRATION OF DIABETES INTO COMPREHENSIVE/PRIMARY EYE CARE

a. Skills enhancement of eye health professionals (e.g., ophthalmologists, optometrists, other eye care providers) relevant to understanding the consequences of DR, and identification, diagnosis, management and treatment of DR, diabetes and its complications

b. Capacity building of secondary and

tertiary points of care practitioners to achieve standardised outcomes for people with DR through training, accountability, and monitoring and evaluation

c. Establishment of safe and quality value-based treatment and clinical care systems

d. Optimised secondary and tertiary point of care services for people with DR through improved health systems and processes enabling care providers to:

i. Be more efficient to address the complications of DR

ii. Be positioned to be able to address anticipated increases in demand for DR responses

e. Patient support with appropriate management strategies to reduce the risk of vision loss attributed to DR

3 HORIZONTAL AND VERTICAL INTEGRATION OF SERVICES

a. Improved referral/recall pathways within and across all levels of the healthcare system

b. Establishment of joint strategies across primary, secondary and tertiary levels of care to ensure patient access to effective and timely information, treatment and follow up

c. Establishment of innovative tactics to reduce the dropout rate of patients across the DR continuum of care

d. Utilisation of tools such as clinical decision making trees in order to enhance the identification of appropriate level of support required for those at risk or living with DR

4 INTEGRATION OF DR POLICIES, GUIDELINES AND TRAINING INTO ALL RELEVANT NATIONAL HEALTH POLICIES,

AND GUIDELINES

a. Inclusion of DR specific policies in National Diabetes Plans, National Noncommunicable Disease Strategic Planning and other relevant high level government policies.

b. Creation of National Action Plans for DR

c. Inclusion of DR into national health insurance schemes to ensure that sufficient coverage is provided to facilitate cost effective screening and treatment for those living with the burden of DR

d. Standardisation of care (for people with diabetes) – achieved through the implementation of and required adherence

to a set of protocols by all secondary and tertiary points of care addressing DR

e. Government approved guidelines for training and implementation of integrated care models

A transition towards integrated diabetes and eye health systems will always be dependent upon available resources and the complexities of each operating environment. This transition process will be particularly challenging in geographies where there is a greater prevalence of vertical healthcare systems – such as low to middle income countries (LMIC) where health services are often developed to meet specific health conditions associated with poverty and epidemics¹¹.



¹¹ Vertical–horizontal synergy of the health workforce Gijs Elzinga (1), Bulletin note of the world health organisation. <http://www.who.int/bulletin/volumes/83/4/editorial10405/en/>

Guiding Principles for Integrated Diabetes and Eye Health Care



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As health providers adopt integrated care for diabetes and eye health, a principles based approach will be key to advancing optimised care for people living with or at risk of DR. These guiding principles can be applied across a variety of approaches and contexts regardless of the nature or degree of integration, as demonstrated in the case studies provided in this compendium.

PEOPLE-CENTRED CARE

Health strategies for the detection and treatment of DR need to be set up in a way that starts from the perspective and the needs of a person diagnosed with diabetes. Approaches to reduce known barriers to access, such as costs and distances to services, as well as ensuring that information, education and services are provided in a culturally acceptable and context appropriate manner and language for patients should be prioritised.

Adherence to this principle will ensure that:

- Patients understand the costs and the benefits of co-delivered care for diabetes and its complications
- Patients understand what to expect during and after diagnostic and treatment procedures
- Patients understand the importance of and take responsibility for self-management
- Patients have an opportunity to discuss fears regarding blindness and treatment
- Patients are supported to bring about positive behavioural change

EQUITY

Eye health services for PWD must be planned and resourced to meet the needs of the whole of a target population, but sufficiently responsive to the needs of the most

marginalised including the those that are poor, people with disabilities and women¹². Such an approach will emphasise that the rights and needs of the most vulnerable people are not forgotten.

Priority should be placed upon ensuring that all PWD have access to the care they need to detect and treat DR without experiencing increased financial difficulty. Cost should not be a barrier to access for required medical care or support services.

Priority should be placed upon ensuring that all people with diabetes have access to the care they need to detect and treat DR without experiencing increased financial difficulty. Cost should not be a barrier to access for required medical care or support services.

QUALITY

Quality care outcomes are achieved through an adequately trained, supported and deployed health workforce. Staff implementing health programmes for PWD should receive appropriate training, accreditation and ongoing professional development to ensure appropriate care is provided safely and is of a good standard. To achieve that end, staff needs must be analysed and planned to manage knowledge and skills gaps, and competent staff should be distributed equitably.

Ultimately, and within local regulatory frameworks, the most appropriate trained personnel, should be available to provide the level of service needed for the individuals and communities in their catchment area. In some contexts this may involve co-delivery of care, task-sharing and task-shifting to ensure that system wide care is optimised, while also recognising the unique responsibilities and competencies of health care practitioners at the three levels of service delivery (primary, secondary and tertiary).

¹² The Commonwealth Diabetic Retinopathy Symposium, 'Preserving the sight of people with diabetes across the Commonwealth – 8 Point Manifesto', 2016

COLLABORATION

Collaboration among care providers is coordinated across the multiple entry points along the diabetes care pathway, starting from support for self-care, detection of DR, through referral to treatment and vision rehabilitation. Interventions for eye health, diabetes and Non-Communicable Diseases (NCDs) will together result in effective, safe and personalised services that meet the health needs of a person with diabetes. The intent is for DR services to be available and accessible for all people around the world living with diabetes, for practitioners to provide services that are of a good standard, and for health information systems to operate in a collaborative manner and in both ways, along referral pathways. Service delivery systems are flexible and responsive to the national and local context, adapting to resources available locally within the private and public sector, and at community level.

EVIDENCE BASE

Provision of care for DR should be based on the best available evidence. Providing evidence-informed care will ensure that finite health resources are used widely and that the care provided is likely to be effective¹³. Programs that utilise evidence and data will also be best positioned for continual improvement in the nature and process of service provision, with findings being applied to:

- Program planning and implementation
- Deploying appropriate technology
- Quality of care
- Evaluation and use of information to improve accountability.

Beyond program cycle management and the provision of safe and effective healthcare,

evidence on the prevalence and the burden of DR and of effectiveness of interventions can be generated, analysed and harnessed to inform advocacy and policy decisions to shape an enabling environment for integrated care.

COST EFFICIENT

Investments in the establishment and scale up of DR programs must represent good value for money for social, public and private investors whilst also being effective¹⁴. While maintaining standards of care and equitable access, service providers should use finances, staff, medicines, medical devices, equipment and technology, and physical infrastructure that are the most cost effective within the local setting. Towards achieving universal health coverage, people and families affected by diabetic retinopathy should be protected from catastrophic expenditure that can push them into poverty and or perpetuate the poverty cycle from having to pay for treatment and supportive healthcare for diabetes and DR.

¹³ Wong, T.Y., Sun, J., Kawasaki, R., Ruamviboonsuk, P., Gupta, N., Lansingh, V.C., Maia, M., Mathenge, W., Moreker, S., Muqit, M.M.K., Resnikoff, S., Verdager, J., Zhao, P., Ferris, F., Aiello, L.P., Taylor, H. R. (2018). Guidelines on Diabetic Eye Care: The International Council of Ophthalmology Recommendations for Screening, Follow-up, Referral, and Treatment Based on Resource Settings. American Academy of Ophthalmology.

¹⁴ McDonald, L, WHO, Eliminating avoidable blindness: a wise investment in developing countries, accessed from IAPB Vision atlas, <http://atlas.iapb.org/socio-economics/wise-investment/>

Recommendations

RECOMMENDATIONS

Recommendations for Primary Health Care Providers: Preventative Action, Improved Results

Primary health care providers have a unique opportunity and responsibility to dramatically reduce the anticipated growth of DR rates globally. Being the first and often only point of care for people living with diabetes they can spearhead integrated care by:

- Building the capacity of existing human resources through regular training and professional development to; improve health literacy of DR among people with diabetes, promote and support self-management and increase detection of DR before the onset of vision loss, and direct people in need of further care to appropriate treatment pathways
- Making eye examinations a standard component of periodic diabetes check-ups at the primary point of care (local diabetes clinic) to ensure more people are examined and to facilitate early detection of DR
- Prioritising health communication through the development and distribution of evidence-based lay-language information to inform and educate people with or at risk of DR of actions to be taken to avoid progression of DR and to manage vision loss
- Providing sufficient information to people with or at risk of DR so that they are empowered to make informed decisions about their care, and are aware of how to access appropriate treatment, follow up and support systems

Recommendations for Secondary & Tertiary Care Providers: Working in Collaboration to Overcome Barriers

Resourced with specialist skills and knowledge – secondary and tertiary care providers can foster the development of integrated eye and diabetes care through playing a leading role in collaborating with other components of the health system. In particular, they can:

- Enable appropriate task-sharing and task-shifting among healthcare personnel: understanding what is the appropriate training (training type, format and frequency), skill sets and support health care professionals and clinic staff at the primary point of care require, so that they are able to provide at risk patients with accurate information, support management of DR, and provide or facilitate essential regular eye examinations as part of routine diabetes care
- Ensure DR treatment and clinical care options are available, accessible, acceptable and of good quality and that patients are linked back into their primary diabetes care providers for seamless ongoing diabetes and eye care management
- Improve collaboration across diabetes and eye health sectors, including through:
 - Establishing robust referral pathways from primary care to specialist services to ensure appropriate and timely clinical care – including clear referral criteria, improved information sharing, established relationships and joint strategies between different levels of health providers
 - Clear definition of the roles and responsibilities of different health care providers in supporting PWD

Recommendations for Government: Driving Change, Exerting Influence

Governments and Departments of Health have the capacity to accelerate migration towards integrated care through the creation of an enabling environment for service providers. In particular, governments can:

- Develop and strengthen regulations, laws, policies and guidelines that support integrated approaches, promote co-delivery of care, including appropriate task-sharing and task-shifting among clinicians and health professionals, and provide context and culturally-appropriate guidance to service providers¹⁵
- Incentivising provision and uptake of appropriate clinical care and support services by PWD, such as appropriate financial coverage of DR services in health insurance or other benefit schemes
- Develop National Action Plans for addressing DR in consultation with relevant stakeholders across the diabetic and eye healthcare spectrum including civil society, the private sector and provincial governments and ensure the integration of such plans into National Diabetes Strategies, Noncommunicable Disease Strategic Planning
- Invest in infrastructure and technology – particularly more cost effective, sturdy and automated technologies more suitable to LMICs for diagnostic and treatment services, and prioritise the development of robust information management and referral systems to promote enhanced integration along the care pathway
- Incentivise adherence to clinical standards and protocols by all, especially for hospital and healthcare-facility based services for PWD and diabetic retinopathy at the secondary and tertiary levels of service delivery

- Include eye health considerations, including DR, particularly in workforce planning for services to be provided at primary, secondary and tertiary level healthcare facilities

Recommendations for Donors, Funding and Investment Partners: Financing for Impact

Donors, funding and investment partners can significantly shape the diabetes and eye health landscape through prioritising and channelling investments into integrated care. In particular, they can:

- Convene multi-stakeholder dialogues to promote the piloting and scale up of integrated care and provide resources and finances for the development, incubation and scale up of such initiatives
- Establish protocols and targets for recipients to adhere to, in order to advance the implementation of integrated diabetes care and eye health services
- Work with national and local governments to prioritise populations and regions of greatest need for integrated care and direct funding to support advancement in those geographies
- Strengthen human resources through increased investment in appropriate training and tools for health care professionals and support services to manage diabetes and improve eye-health.

The case studies presented in this report have been mapped against integration type. Many of these case studies reflect multiple approaches to integration and reflect a number of the guiding principles articulated in this report.

¹⁵ International Agency for the Prevention of Blindness, International Council of Ophthalmology, World Council of Optometry and International Diabetes Federation, 'Strengthening Health Systems to Manage Diabetic Eye Disease: Integrated Care for Diabetes and Eye Health'

Evidence-based leaflet to promote uptake of retinal screening among young adults in Australia

INTEGRATION TYPE

Integration of eye care into routine diabetes care/primary care

TARGET POPULATION

 Young adults with type 2 diabetes, aged 18-39 years

SETTING

 Income Group: High income
Region: Statewide (Victoria)
– urban, regional and rural

IMPACT

 Initially: 2,049 young adults.
Ongoing impact via Vision Initiative campaigns.

PROJECT BUDGET

 USD \$198,000



PROJECT TIMELINE

Dec 2012 – June 2015

AUTHORS

Dr Amelia Lake and Professor Jane Speight from The Australian Centre for Behavioural Research in Diabetes, a partnership for better health between Diabetes Victoria and Deakin University www.acbrd.org.au

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PROJECT EXPENDITURE – PRIMARY COSTS

- 1) Staffing
- 2) PhD scholarship
- 3) Production and distribution

SOURCE OF FUNDING:

Vision 2020 Australia provided the finances required for this project through Vision Initiative funding for the Diabetes and Eye Health project.

ABOUT THE CASE STUDY

The problem

The average age of onset of type 2 diabetes is decreasing, with more people developing the condition before 40 years of age. However, few complication awareness/diabetes self-management education resources are tailored to this population. Early exposure to this aggressive form of type 2 diabetes predisposes affected individuals to increased risk of early development, and rapid progression of diabetic retinopathy which is the leading cause of vision loss and blindness in working-age adults. Young adults with type 2 diabetes have low engagement with diabetes self-care, including retinal screening, the proven clinical pathway to prevention of vision loss from diabetic retinopathy¹⁶. Collectively, PWD and health professionals have called for resources and services to promote the uptake of retinal screening specifically tailored to the unmet needs of this priority population.

Overview of the intervention/program

The aim was to develop a public health intervention to promote uptake of retinal screening among young adults with type 2 diabetes. Our three key objectives were to: a) identify their barriers to and enablers of retinal screening uptake; b) develop a brief, tailored, and culture/age-appropriate leaflet, which could be distributed to the priority population by Diabetes Victoria; and c) evaluate the leaflet's effectiveness in increasing self-reported uptake of retinal screening and addressing the factors underlying this behaviour.

Intervention/program details

The key feature was the content (targeted psycho-educational messages), reinforced with verbatim quotes and appealing design/imagery. Our comprehensive needs

¹⁶ For further reading see: Lake AJ, Rees G, Speight J. Clinical and Psychosocial Factors Influencing Retinal Screening Uptake Among Young Adults with Type 2 Diabetes. *Curr Diab Rep.* 2018 May 24;18(7):41

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Leaflet used for promotion of retinal screening for young adults. ©Vision 2020 Australia, 2018. All rights reserved

assessment (in-depth interviews, nationwide survey, literature review¹⁷) identified factors impacting retinal screening uptake among young adults with type 2 diabetes. We used this evidence base to develop psycho-educational message content using theoretically-grounded behaviour change methods. For example, messages addressed knowledge gaps, encouraged positive attitudes toward retinal screening, reinforced (normative) beliefs about the screening behaviour of similar others, and promoted behavioural skills to overcome screening barriers. The messages were reinforced with verbatim quotes and age-appropriate imagery and incorporated into an 8-panel leaflet: *'Who is looking after your eyes?'* These features ensured the leaflet was appealing, accurate, acceptable and addressed the needs of the priority population.

IMPACT AND LEARNING

What was the impact and why did it work?

The study demonstrated: a) high engagement with the leaflet among young adults with type 2 diabetes,¹⁸ and b) that reading the leaflet significantly increased knowledge of diabetic retinopathy, an important enabler of retinal screening¹⁹. This was achieved because our needs assessment identified the specific knowledge, motivational factors and behavioural skills impacting retinal screening uptake among this priority population. In tailoring the leaflet to young adults with type 2 diabetes, we were able to address a key concern – i.e. a lack of diabetes self-management resources addressing the needs and characteristics of this group. Finally, the leaflet has had widespread reach: it was distributed to all young adults with type 2 diabetes throughout the Australian state of Victoria (N=2049) and remains freely available in electronic format.

Challenges and learning

With a lack of dedicated programs or services for young adults with type 2 diabetes, our first challenge was how to contact the priority population and deliver the intervention. Australia's largest diabetes register (National

¹⁷ For further information see: Lake AJ, Browne JL, Abraham C, Tumino D, Hines C, Rees G, Speight A. A tailored intervention to promote uptake of retinal screening among young adults with type 2 diabetes - an intervention mapping approach. BMC Health Services Research. 2018;18:396

¹⁸ *ibid*. Fidelity checks were also conducted during the Randomised Controlled Trial evaluation. The checks demonstrated that the eye health leaflet was read by the majority of those who had received it (95%).

¹⁹ At follow-up, the leaflet intervention group reported greater knowledge of DR relative to the control group ($t_{(72)} = -2.213, p < .05; CI: -2.14$ to -1.1), with moderate effect size ($n^2 = .05$)

Diabetes Services Scheme) was determined as the best reference point. However, use of the (primarily postal) NDSS database dictated the intervention format, which needed to be print-based. Fortunately, previous research demonstrated that young adults with type 2 diabetes prioritise credibility of information over format. Importantly, we learned that flexibility in the face of real-world constraints was a key factor.

Most studies evaluating interventions targeting youth/young adults with type 2 diabetes face recruitment/attrition challenges. Some barriers that we faced were: low overall prevalence of young adults with type 2 diabetes, lack of engagement with diabetes research; and over-representation of racial/ethnic minority groups. To address these, we:

- engaged with key health advocacy stakeholders
- ensured that the leaflet was developed to appropriate literacy levels
- involved members of the priority population from inception

See a range of publications arising from this project for more information²⁰.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health:

With the combined benefits of low cost, broad reach, consistency of message and wide public acceptance, leaflets are widely used for health promotion purposes. However, many leaflets are not evidence-based and, consequently, waste resources and miss a crucial opportunity to promote health. This case study is important because it provides a blueprint for others wishing to systematically develop a brief, print-based resource, especially for those typically considered 'hard-to-reach'. Our work involved multidisciplinary collaboration and involvement of members of the priority population throughout (considered 'best practice' in intervention development and evaluation). Further, our collaboration with Diabetes Victoria enabled us to ensure sustainability of the resource via their website and wide-spread distribution via Australia's NDSS. Finally, this work also provides important insight into the unmet psychosocial needs of young adults with type 2 diabetes, which will assist with the development of more diabetes self-management resources tailored to this priority population.

Getting a diabetes eye health check is easy.

- You don't need a referral from your GP. You can book an appointment directly with an optometrist. When you do, be sure to tell them you have diabetes.

What is a diabetes eye health check?

- It is different to a standard eye check because it specifically looks to see whether diabetes is affecting your eyes.
- It is usually done by an optometrist who will take a photo of the back of your eye.
- Your optometrist will look at the photo to check the blood vessels at the back of your eye for signs of diabetes-related eye damage.

What else do I need to know?

- A diabetes eye health check takes about 30 minutes.
- It may be free (bulk-billed) or there may be a small fee.
- Your optometrist may use eye drops which helps them to see the back of your eye. If you do have eye drops, they may be a little uncomfortable. The drops will also leave you sensitive to light, so bring your sunglasses and be prepared to wait a while for your vision to return to normal.

What happens next?

- If they see any signs of damage to the back of your eye, your optometrist will either monitor it or arrange treatment with an ophthalmologist (medical eye specialist).

Either way, discuss your results with your GP or your diabetes specialist.

Jenny's story
Jenny, aged 36, diagnosed with type 2 diabetes 6 years ago

Before the diabetes eye health check

"I was scared. I was scared of what damage was done... of confronting the fact that my eyesight could be damaged, and of going through the exam and being confronted with what's there. But I want to take care of my kids; I want to be able to see their children one day. I do want to be able to grow older and have my vision."

After the eye health check

"It was actually quite fun; I don't know why I put it off. I was really scared going in there, but definitely not now - I'm not fazed by it at all. The eye drops were a bit uncomfortable and there was a small cost - but I think it's a wise spend considering what you're preventing. Overall, it was worth it and the thought that I can control this gives me real peace of mind."

Jenny's advice to you

"I suppose if I was telling someone that's just been diagnosed, I would be saying to them 'Don't wait to be told and don't wait until you notice changes - book an eye health check now.' Discuss with the optometrist what to expect, what you should be aware of and so on. I had a lovely optometrist, she really put me at ease."

What happens if I have DR?

- Your eye health professional will advise you of your treatment options.
- In the early stages, treatment may not be needed, but you may be asked to have eye health checks more frequently to monitor the DR.
- You can slow progression of DR by keeping your blood glucose, blood pressure and cholesterol as close to target as possible.
- If DR progresses, you may need to take tablets or have specialist treatment (usually laser therapy).

What can I do to protect myself from DR and prevent vision loss?

- 1. Have a diabetes eye health check**
Have a diabetes eye health check when diabetes is first diagnosed and then at least every two years (more often if recommended by your optometrist).
- 2. Treat DR early**
Early treatment can prevent up to 98% of severe vision loss.
- 3. Follow your diabetes treatment plan which includes the diabetes ABCs.**

A Average blood glucose (HbA1c) below 7% (5.3mmol/mol)
Every 1% (11mmol/mol) decrease in HbA1c lowers your risk of developing DR by 30-40%.

B Blood pressure below 130/80 mm Hg
Keeping your blood pressure at target slows progression of DR.

C Cholesterol at target
LDL cholesterol less than 2.0 mmol/L, triglycerides less than 2.0 mmol/L.

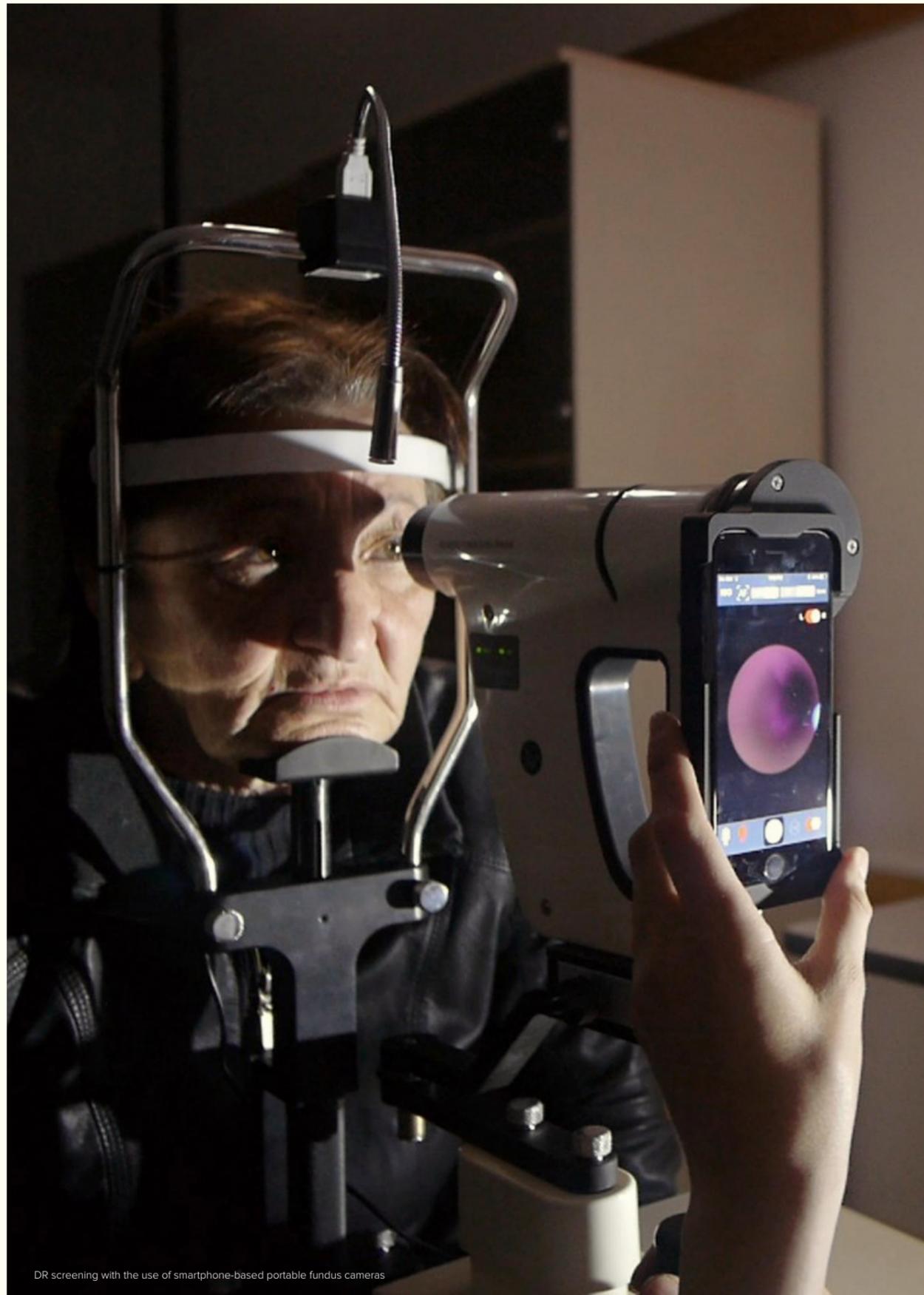
Leaflet used for promotion of retinal screening for young adults. ©Vision 2020 Australia, 2018. All rights reserved

²⁰ Lake AJ, Browne JL, Abraham C, Tumino D, Hines C, Rees G, Speight J (2018) A tailored intervention to promote uptake of retinal screening among young adults with type 2 diabetes - an intervention mapping approach. BMC Health Services Research. 18(1):396

Lake AJ, Rees G, Speight J (2018) Clinical and Psychosocial Factors Influencing Retinal Screening Uptake among Young Adults with Type 2 Diabetes. Current Diabetes Reports. 18(7):41

Lake AJ, Browne JL, Rees G, Speight J (2017) What factors influence uptake of retinal screening among young adults with type 2 diabetes? A qualitative study informed by the Theoretical Domains Framework. Journal of Diabetes and Its Complications. 31(6):997-1106

Lake AJ, Browne JL, Speight J (2018) Comment on 'Adherence to diabetic eye examination guidelines in Australia: The National Eye Health Survey' Medical Journal of Australia. (IF:4.227), 208(2):97



DR screening with the use of smartphone-based portable fundus cameras

Preventing Blindness from Diabetic Retinopathy and Other Diabetes-Related Eye Diseases in Armenia

INTEGRATION TYPE

Horizontal and vertical integration of services

TARGET POPULATION

 People with diabetes with special attention to patients residing outside of the capital city Yerevan

SETTING

 Income Group: Upper middle income (Lower middle income at inception of the project);
Region: Rural

IMPACT

 Anticipated 40% increase in identified cases of and laser treatments for DR performed via the Mobile Eye Hospital and Regional Eye Centers

PROJECT BUDGET

\$\$\$ USD \$642,064

PROJECT TIMELINE

 March 2017 – June 2020

AUTHORS

Armenian EyeCare Project

PROJECT EXPENDITURE – PRIMARY COSTS

- 1) Equipment
- 2) Training
- 3) Public Awareness

SOURCE OF FUNDING:

World Diabetes Foundation, AECF, corporate and private donors

ABOUT THE CASE STUDY

The problem

Quality health care remains inaccessible for most of the population of Armenia and is subpar in several specialty areas of medicine including endocrinology and chronic disease management. While the majority of the population lives throughout the regions of Armenia, healthcare sub-specialists are concentrated in the capital city of Yerevan further restricting the accessibility of healthcare services for those in need.

Overview of the intervention/program

Since 2012, Armenia has been implementing a strategy to prevent diabetes and improve disease management and care. Unfortunately, this strategy did not envisage specific action on diabetes-related eye diseases. The Armenian EyeCare Project (AECF) bridges this gap by integrating DR screening and treatment of people with diabetes into its ongoing countrywide eye care program.

Intervention/program details

Provide medical technology and artificial intelligence. AECF has provided ophthalmoscopes and smartphone-based portable fundus cameras for the screening, imaging, diagnosis, and DR treatment at the primary level in the regions. At the secondary level (made up of AECF Regional Eye Centers - REC and the Mobile Eye Hospital – MEH), the Project has provided non-portable fundus cameras and state-of-the-art lasers for DR treatment. AECF has introduced an innovative software program to Armenia, which uses artificial intelligence to grade fundus photographs and to diagnose DR. This method eliminates the need for a physician to diagnose each patient, and a database of retinal images, available on a cloud-based network, also enables peer

review and unified record keeping.

Build professional capacity. AECP is providing training for family doctors, nurses, endocrinologists and ophthalmologists. The structure of the project reinforces the crucial links among family doctors, endocrinologists and ophthalmologists throughout Armenia.

Increase access to quality care. Patients with diabetes and those at risk are referred for eye screening at the primary level and in screening camps in poor and underserved communities. Diagnosed DR cases are referred for treatment at the AECP RECs or MEH where specialized care is provided.

Raise public awareness. The Project aims to increase the national demand for DR identification and treatment, and to provide public education on the links between diabetes, eye health and general health. Through creating awareness of lifestyle management and the risk factors of DR, the Project encourages people with diabetes to undergo regular eye screenings. In addition,

family doctors receive training on diabetes and eye care so that they can educate their diabetic patients on the characteristics and management of their disease.

IMPACT AND LEARNING

What was the impact and why did it work?

The impact of the project will be determined by monitoring and evaluating each of the individual components of the project. These components will include training of health care specialists, an increase in the number of identified cases of diabetic retinopathy, and an increase in the number of laser treatments for diabetic retinopathy performed via the Mobile Eye Hospital — approximately 40 percent. AECP's comprehensive design and implementation approach has motivated other non-profit organizations to donate two lasers to perform treatments for diabetic retinopathy. The project also aims to use knowledge gained to impact national decision-making processes on diabetes, including policy for

TOTAL ARMENIA	Total March 2017 – July 2018	Planned results for the project 2017–2020
EYE HEALTH SERVICES		
General screening	15,500	50,000
Total people referred to MEH or REC for detailed examination	5,000	8,000
Total PWD passed photo imaging	6,548	18,000
Revealed having Non-proliferative DR	1,697	n/a
Revealed having Proliferative DR	404	n/a
People who had DR Laser treatments	232	300
People passed surgical treatment of diabetic cataract	208	200
TRAINING OF HEALTH CARE SPECIALISTS		
Ophthalmologists	40	100
Endocrinologists	34	100
Family Medical Doctor/GP (including ToT for public education)	289	550

diabetes-related eye diseases and overall integrated care for PWD.

Challenges and learning

The use of Artificial Intelligence requires a strong and uninterrupted Internet connection, which is not available in all regions at this time. The Project has supplemented fundus cameras with mobile Internet connections, which partially overcome this infrastructure gap. AECP continues to search for the best long-term operating model, which will achieve a balance between sustainability and quality service delivery.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?

In the absence of government policy for diabetes related eye diseases, this case study demonstrates how one organisation can create significant impact through a targeted approach towards the identification and treatment of DR. This specific health intervention is comprehensive in nature and

includes the development and training of local professionals, reinforcing links among them, providing necessary equipment and materials for public education, as well as bringing key issues for action to the attention of policy makers key issues for action.

Quick and quality service delivery can be achieved if performed by Yerevan-based specialists traveling from region to region to perform DR screening and photographing the retinas of people living with diabetes. However, this is not a long-term or efficient solution. AECP is working towards a truly sustainable solution through developing and contributing to a more efficient eye health system in Armenia by training regional ophthalmic personnel and partnering them with project trainers who will supervise their work in the field.

The integration of the DR project into the AECP's country-wide program "Bringing Sight to Armenian Eyes" ensures wide coverage and timely specialized care and builds on existing expertise and capacity. This new approach to DR prevention in country has great potential and will be expanded in Armenia.



Training sessions for regional FMDs on diabetes and healthy lifestyle with the use of newly-designed posters in Armenian



Capturing a fundus photo from a patient in Bangladesh
(Photo Credit: Orbis International)

International Case Studies of Integrated Care for Diabetes and Eye Health

Comprehensive, integrated diabetes care for children in Bangladesh

INTEGRATION TYPE

Integration of eye care into routine diabetes care/primary care

TARGET POPULATION

 Children 18 years and below living with diabetes

SETTING

 Income Group: Lower middle income; Region: Rural and urban

IMPACT

 3,018 children screened for eye disease and refractive error

PROJECT BUDGET

 USD \$98,810

PROJECT TIMELINE

 November 2016 – February 2018

AUTHORS

Orbis International; Mohammed Awlad Hossain, Senior Monitoring and Evaluation Manager, Mohammed Alauddin, Director of Programs, Dr. Lutful Husain, Senior Medical Specialist, Clare Szalay Timbo, Senior Program Manager, Asia Region and Dr. Munir Ahmed, Country Director, Orbis International Bangladesh and CDiC; Dr. Bedowra Zabeen, Pediatric Diabetologist.

ACKNOWLEDGMENTS

Changing Diabetes in Children Program (CDiC), Diabetes Association of Bangladesh (BADAS), USAID-CBP

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) Equipment and supplies
- 2) Training, outreach, treatment, and promotional materials
- 3) Partner salaries

SOURCE OF FUNDING:

USAID Childhood Blindness Program (USAID-CBP)

ABOUT THE CASE STUDY

The problem

There are an estimated 530,000 children < 15 years of age with Type 1 Diabetes (T1DM) globally²¹, and possibly as many with Type 2²². Six of 10 countries with the most known children with diabetes are in developing areas²³. The global number of children with diabetes is growing rapidly and evidence shows that poor care during childhood increases the risk of ocular complications throughout later life²⁴. The International Diabetes Federation (IDF) estimates the incidence of T1DM among children 0-14 years in Bangladesh at 4.2 new cases per 100,000/year, or over 3,000 children newly developing this disease annually²⁵. At the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), there has been an upward trend in the number of newly diagnosed children, from 112 cases in 2008 to 319 cases in 2013, as documented by the Changing Diabetes in Children (CDiC) program at BIRDEM. ²⁶However, this project has detected 3018 children with diabetes through walk-in and outreach camps up to February 2018.

Overview of the intervention/program

From September 2016 to February 2018, Orbis International worked with BADAS to create a scalable, comprehensive model of eye care for children living with diabetes in Bangladesh.

²¹ Patterson C, Guariguata L, Dahlquist G, Soltész G, Ogle G, Siliak M. Diabetes in the young - a global view and worldwide estimates of numbers of children with type 1 diabetes. *Diabetes Res Clin Pract.* 2014 Feb;103(2):161-75.

²² Demmer RT, Zuk AM, Rosenbaum M, Desvarieux M. Prevalence of Diagnosed and Undiagnosed Type 2 Diabetes Mellitus Among US Adolescents: Results From the Continuous NHANES, 1999-2010. *American Journal of Epidemiology.* 2013;178(7):1106-1113.

²³ Rwiza HT, Swai AB, McLarty DG. Failure to diagnose diabetic ketoacidosis in Tanzania. *Diabet Med.* 1986 Mar;3(2):181-3.

²⁴ Anderzén J, Samuelsson U, Gudbjörnsdóttir S, Hanberger L, Åkesson K. Teenagers with poor metabolic control already have a higher risk of microvascular complications as young adults. *J Diabetes Complications.* 2016 Apr;30(3):533-6. doi: 10.1016/j.jdiacomp.2015.12.004.

²⁵ IDF Word Atlas (8th Edition). 1 June 2018

(Ref. Indian J Endocrinol Metab. 2015 Apr; 19(Suppl 1): S9-S11

²⁶ (Ref. Indian J Endocrinol Metab. 2015 Apr; 19(Suppl 1): S9-S11



The project built on the existing CDiC program for the delivery of high-quality diabetes care for children living in low-resource settings. It is among the first in the world focused specifically on reducing the burden of vision impairment among children living with diabetes in LMICs.

Intervention/program details

Through the integration of eye care into an existing, child-focused model of diabetic care services, and establishing referral pathways between communities, government facilities and specialized hospitals, this program enabled children living with diabetes in poor communities in Bangladesh to receive both life-saving and sight-preserving care. Two child-friendly centers were established at BADAS hospitals in Bogra and Dhaka and were supported by Orbis through the provision of training in diabetic retinopathy to ophthalmologists, image graders and counsellors. Through outreach efforts and events, children living in communities in hard to reach areas were provided screening and education.

This model has become an integral part of comprehensive diabetic care for children, with eye care services being incorporated into service packages at BADAS hospitals.

Importantly, this program has become self-sustaining and is continuing beyond the funding cycle for the project. The fundus camera that was provided for this centre is being used for adults and children and is generating revenue. Staff trained for this project have been retained, and as a result patient volume has increased at the hospital further contributing to the sustainability of the program.

Ensuring that costs are kept to a minimum, patients are paying subsidized fee for services and project partners are receiving insulin at no cost from associated pharmaceutical companies.

IMPACT AND LEARNING

What was the impact and why did it work?

By integrating eye care services into the care delivered by CDiC and BADAS, the project enabled children living with diabetes to be screened regularly for diabetic eye disease, and provided timely treatment and appropriate monitoring. Collaborating closely with CDiC, Orbis provided technical support and essential equipment to ensure screening and identification of eye conditions were incorporated into children's routine diabetic care, and a strong referral network was established within the hospitals in two cities.

Outreach camps were organized in strategic locations to ensure children living in remote areas could access screening services. A total of 3,018 children were screened for eye disease and refractive error over two years; 469 children received treatment, 307 received eyeglasses and 81 paediatric surgeries (including 44 cataract) were performed. A total of 113 children were detected to have DR and all of them received treatment in the form of DM control, laser, etc. as per grading protocol. The data from this project demonstrate that children with diabetes in Bangladesh experience high rates of conditions such as cataract and refractive error, as well as diabetic retinopathy.

Challenges and learning

An external evaluation conducted by Dr. Naushad Faiz²⁷ in November 2017 provided the following lessons learned:

- Outreach camps ensure access to rural populations
- Children with diabetes need to be provided follow up care at least until they reach the age of 26 years
- Facilities caring for children with diabetes should employ an ophthalmologist full time to cater to their eye needs
- Strong management and regular coordination meetings ensured the project was implemented smoothly
- World Sight Day and World Diabetes Day activities raised awareness around eye care and diabetes, and
- Information, Education and Communication (IEC) materials are important to impart knowledge on diabetes and eye care to children and families.

A major challenge faced was working to ensure children came for follow up visits after receiving initial screening and treatment. The barriers identified around this challenge included high direct and indirect costs for care, particularly transportation and parents' time away from work.

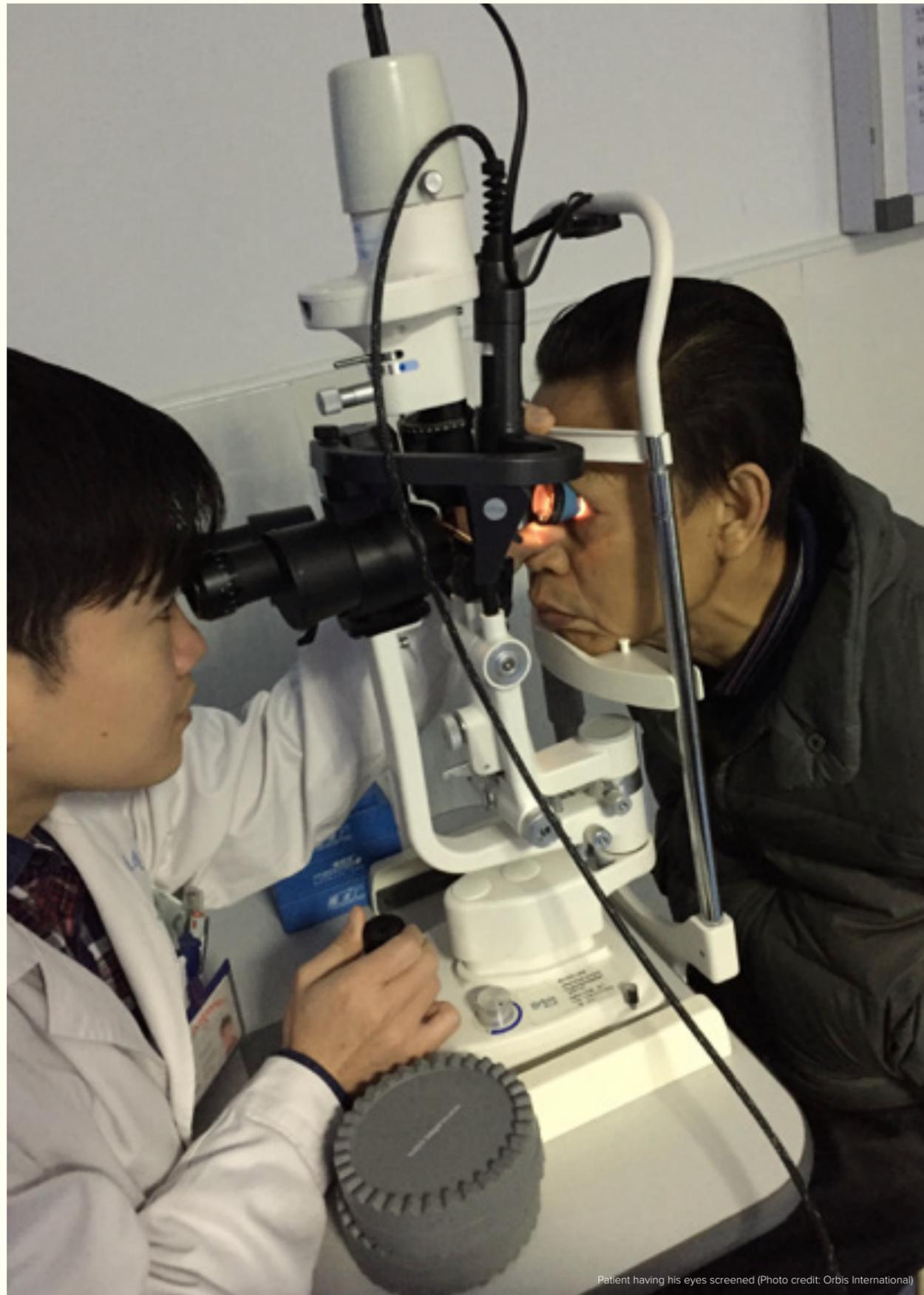
CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

This project validates the importance of integrating eye care into primary diabetes care for children, and the need to strengthen networks for eye care treatment. Two research projects are currently underway to better understand the incidence and risk factors of diabetic retinopathy and cataract in children living with diabetes. This knowledge will reduce the burden of ocular complications and allow us to advocate effectively for better health coverage, including eye care, for children with diabetes in Bangladesh.

BADAS hospitals have established a scalable and sustainable model of eye care for children with diabetes, and continue to deliver high quality diabetic care. The BADAS staff work closely with children and their parents to ensure families are aware of the importance of providing timely, routine care to manage all facets diabetes, including care for the eyes.

²⁷ Mr. Naushad Faiz holds a PhD in Economics. He has 34 years of experience in working in the field of development as a researcher, consultant and program manager. He has conducted consultancies in a wide variety of areas, including evaluation and design of eye care and disability inclusive projects.



Patient having his eyes screened (Photo credit: Orbis International)

International Case Studies of Integrated Care for Diabetes and Eye Health

A successful integration of DR into comprehensive, county-level eye care in rural China

INTEGRATION TYPE

Integration of diabetes into comprehensive/primary eye care

TARGET POPULATION

 General populations served by 10 rural country hospitals in Guangdong Province

SETTING

 Income Group: Upper middle income; Region: Rural

IMPACT

 Anticipated 313,713 eye examinations completed

PROJECT BUDGET

 USD \$3.185 million (PHASE I)

PROJECT TIMELINE

 Phase I: July 2012 – September 2017.

 Phase II: December 2017 – March 2020

AUTHORS

Orbis International: Dr. Nathan Congdon, Director of Research and North Asia Strategy; Dr. Peter Xu, Director of Programs; Clare Szalay Timbo, Senior Program Manager, Asia Region

ACKNOWLEDGEMENTS

Zhongshan Ophthalmic Center (ZOC)

PROJECT EXPENDITURE – PRIMARY COSTS

- 1) Medical supplies
- 2) Partner salaries
- 3) Partner travel costs

SOURCE OF FUNDING:

World Diabetes Foundation, private funds and partner contributions

ABOUT THE CASE STUDY

The problem

Guangdong is among China's most populous provinces with approximately 104 million inhabitants.²⁸ The recent national, rural-based survey found blindness rates in Guangdong second only to Yunnan province.²⁹ While cataract remains the leading cause of vision impairment in China, surgical rates are rising rapidly to meet demand and the government provides national insurance to 98% of its rural population, providing support for further expansion of service delivery. The Comprehensive Rural Eye Service and Training (CREST) project focuses on glaucoma and diabetic retinopathy (DR) which are increasingly common in rural China, and are more complex to diagnose and treat than cataract. Diabetes has increased ten-fold in China since 1980, and fewer than 10% of those with DR in rural areas receive treatment.³⁰ It is estimated that 120 million people in China are living with diabetes, the largest number of any country in the world, a third of whom are believed to have DR. A major barrier to sight-saving treatments for DR in rural China is the lack of training and equipment at county hospitals, and lack of understanding of the disease among rural patients.

Overview of the intervention/program

Phase I of the CREST project sought to create a high-quality model of diabetic care in a network of 10 rural country hospitals by providing comprehensive training at ZOC, the coordinating center for country eye professionals. The project established and tested a sustainable and scalable model of photo-based, county-level DR screening, and increased the knowledge of those living in the catchment area about the need for screening and treatment. **Intervention/program details**

The creation of a comprehensive vision network at the rural country level was essential to ensure that rural-dwellers could access care and be screened for conditions before they became

²⁸ China NBS: 6th National Population Census (31 May 2018)

²⁹ Zhao JL, et al. Prevalence of vision impairment in older adults in rural China: the China Nine-province survey. *Ophthalmology*, 2010.

³⁰ Wang FH, et al. Prevalence of diabetic retinopathy in rural China: The Handan Eye Study. *Ophthalmology*, 2008.

symptomatic and missed the window for timely treatment. Integrating glaucoma and DR screening into comprehensive primary eye care services demonstrated that county-level facilities could provide high-quality care, and would in fact invest their own resources in purchasing necessary equipment, due to the potential for cost recovery (Chinese National Health Insurance covers 70% of the cost, with patient out of pocket payments averaging 30%). The key factors that make the program scalable are that screening involves non-medical personnel (freeing up scarce medical resources for treatment), and that basic laser care is delivered at the county level, relieving the burden of care at tertiary facilities.

IMPACT AND LEARNING

What was the impact and why did it work

Phase I ended in September 2017 with numerous achievements, including:

- 129 trainings of local doctors in management of DR and glaucoma (280% of target),
- 199,819 comprehensive eye examinations completed at the 10 clinics and 113,894 examinations done during community outreach activities
- 2,343 glaucoma cases detected in the clinics and 767 in communities
- 6,241 DR cases identified in the clinics and 685 in communities
- 1,439 glaucoma surgeries (180% of target) and 757 laser DR treatments done at county hospitals

Phase II of the project, designed to improve systemic diabetes care and outreach to township facilities, began in 2017 and six of the most successful facilities are involved in the second phase of programming.

Challenges and learning:

A formal evaluation was carried out by Dr. Tao Ran, MD, MPH by WDF in 2017. The report noted that while most of the county-level partners had been successful in acquiring the capacity to manage glaucoma and DR independently, the largest challenge was incorporating comprehensive examination, fundus photography by nurses and the use of EMR into their formal routine. The lessons learned from project-based research include:

- non-medical graders can more accurately detect DR than trained local ophthalmologists and they achieve or surpass UK NHS standards of accuracy
- automated SMS messages can triple the rates of eye care follow-up among DR patients
- more important than educational videos to convince patients to accept comprehensive eye exams for detecting DR is providing such exams for free.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

This case study shows that county hospitals, the major eye care provider for China's rural-dwellers, will sustain and invest their own resources in a model of high-quality integrated eye care which includes DR services. The project has served as a laboratory for research to highlight key aspects of a successful model. The research findings in CREST are now helping to drive Orbis' global DR programs in the direction of using non-medical graders in order to maximize accuracy and reduce the burden on practitioners, freeing them up to focus on providing DR care.

Reduction in Blindness in the English County of Gloucestershire

INTEGRATION TYPE

Integration of eye care into routine diabetes care/primary care

TARGET POPULATION

 Community of people with diabetes

SETTING

 Income Group: High income;
Region: County of Gloucestershire – semi rural

IMPACT

 23,452 screenings in 2017

PROJECT BUDGET

 USD \$977,528 at a cost of \$42 USD per screen (2018/2019)

PROJECT TIMELINE

 1998 – present

AUTHORS

Professor Peter Scanlon, Clinical Lead, Gloucestershire Diabetic Eye Screening Programme & Clinical Director NHS Diabetic Eye Screening Programme in England

ACKNOWLEDGEMENTS

The Gloucestershire Diabetic Eye Screening Team, Stephen J Aldington, Gloucestershire Research and Education Manager, Irene M Stratton, Senior Statistician, Gloucestershire Retinal Research Group

PROJECT EXPENDITURE – PRIMARY COSTS

- 1) Staff
- 2) Equipment
- 3) Training

SOURCE OF FUNDING:

Recurring public funding

ABOUT THE CASE STUDY

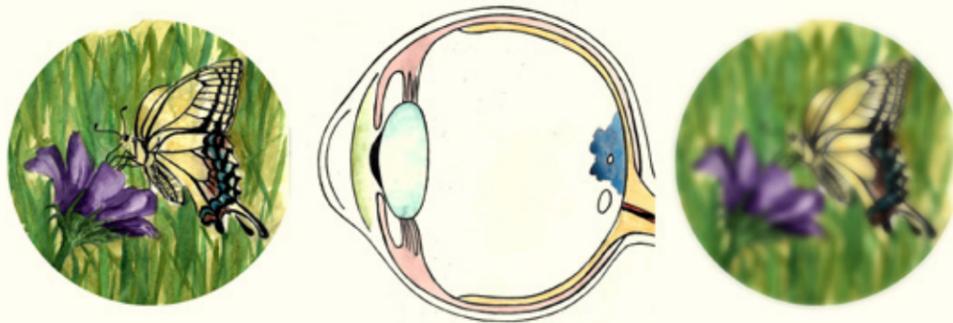
The problem

A Gloucestershire countywide Primary Care Audit undertaken in 1995/6 identified 9566 people with diabetes over the age of 16 years (2.1% of the county's population). However, for those identified to have diabetes, 32% had no record of eye examination results in the proceeding 15-month period. As a result, diabetes patients were regularly presenting late to the Hospital Eye Service with advanced DR that was difficult to treat.

Overview of the intervention/program

At the countywide audit day, a proposal was made to commence a screening programme based on digital photography. This was a novel approach at that time because all previous photographic screening programmes had used 35mm film or Polaroid film. The Gloucestershire Diabetic Eye Screening Programme (GEDSP) was the first digital diabetic eye screening programme in England. GDESP commenced in 1998 with the aim of reducing blindness within the population with diabetes - in the county, through early detection and effective treatment of sight threatening DR. The research programme was designed to demonstrate the effectiveness, and cost-effectiveness of digital photography in diabetic eye screening.

PS Diabetic Macular Oedema



Artist: Kelly Noble

Intervention/program details

Through GDESP a reliable screening test was provided by professional and friendly staff, which was appreciated by patients. Importantly, the costs of screening and effective treatment were not only affordable within the health care budget but also proved to be less than the cost of blindness. This approach meant that the program was found to be effective, cost effective and have high population coverage with the results published in 2003ⁱⁱ.

As a follow on from the success of the GDEP, a National Screening Programme was announced in 2003 with the Gloucestershire team asked to oversee the roll out of the National Screening Programme in England until the formation of Public Health England in 2012. The Gloucestershire Clinical Lead has continued in the role of Clinical Director for the NHS Diabetic Eye Screening Programme in England.

IMPACT AND LEARNING

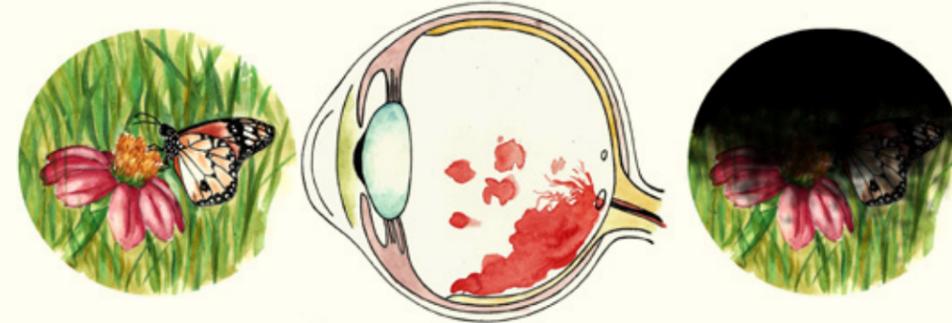
What was the impact and why did it work?

The introduction of the Gloucestershire Eye Screening Programme 20 years ago has meant that the vitreoretinal surgeons in Gloucestershire are performing fewer vitrectomies for advanced diabetic eye disease. Moreover, the vitrectomies are now usually performed for conditions like recurrent vitreous haemorrhage rather than the more advanced fibro-proliferative disease with retinal detachment, which was more frequent in 1998. This trend has been observed across England with the roll out of the NHS Diabetic Eye Screening Programme.

Between August 2005 and July 2008, 16 people in Gloucestershire were registered blind (Seriously Sight Impaired SSI) with the principal cause DR, an annual rate of 25.4 per 100,000 of those with diabetes (95% confidence intervals c.i. 15.0 to 40.4). A further 26 were registered as Partially Sighted (Sight Impaired SI) with the principal cause DR, an annual rate of 41.3 per 100,000 of those with diabetes (95% c.i. 27.6 to 59.6).

ⁱ Scanlon PH, Malhotra R, Thomas G, et al. The effectiveness of screening for diabetic retinopathy by digital imaging photography and technician ophthalmoscopy. *Diabet Med* 2003;20(6):467-74.
ⁱⁱ Scanlon PH, Malhotra R, Greenwood RH, et al. Comparison of two reference standards in validating two field mydriatic digital photography as a method of screening for diabetic retinopathy. *Br J Ophthalmol* 2003;87(10):1258-63.

PS Vitreous Haemorrhage



Artist: Kelly Noble

Between April 2014 and March 2017, there were only 2 notifications of blindness due to DR (annual rate 2.0 per 100,000 with diabetes, 95% c.i. 0.3 to 6.7) and 10 notifications of partial sight (10 per 100,000 with diabetes, 95% c.i. 5.1 to 17.9).

The reductions in rates of blindness (SSI) and in partial sight (SI) were significant ($p < 0.0001$ for both).

In 2014 it was reportedⁱⁱⁱ that diabetic retinopathy was no longer the leading cause of blindness in the working age group in England.

Challenges and learning

In the Gloucestershire population:

1 The number of people with diabetes has risen from 9566 people with diabetes (2.1% of the population) in 1995/96 to 35,874 (5.7% of the population) in 2017/18. Of the 35,874 people with diabetes in the county, 30,696 were eligible to be invited (some were already under the HES or were terminally ill etc..) and 23,452 (76.4%) were actually screened in the 12 month period.

2 A study^{iv} demonstrated that diabetes and sight-threatening diabetic retinopathy was associated with socioeconomic deprivation, but

non-sight-threatening diabetic retinopathy was not. Uptake of screening was less in those with most socioeconomic deprivation.

3 Other factors that were shown^v to influence uptake were factors relating to primary care.

4 Delay in diabetic retinopathy screening was also shown^{vi} to increase the rate of detection of sight threatening DR.

5 Certain groups have been shown^{vii} to be at lower risk of development of sight threatening retinopathy and can safely be screened every two years.

CONCLUSION

The relative reductions in vision loss in this area of England due to systematic screening, treatment for diabetic eye disease, tighter control of glycaemia and hypertension and earlier diagnosis of diabetes cannot be estimated from these data but all are likely to have contributed to this welcome change.

ⁱⁱⁱ Liew G, Michaelides M, Bunce C. A comparison of the causes of blindness certifications in England and Wales in working age adults (16-64 years), 1999-2000 with 2009-2010. *BMJ Open* 2014;4

^{iv} Scanlon PH, Carter SC, Foy C, et al. Diabetic retinopathy and socioeconomic deprivation in Gloucestershire. *J Med Screen* 2008;15(3):118-21. doi: 10.1258/jms.2008.008013

^v Lindenmeyer A, Sturt JA, Hipwell A, et al. Influence of primary care practices on patients' uptake of diabetic retinopathy screening: a qualitative case study. *Br J Gen Pract* 2014;64(625):e484-92. doi: 10.3399/bjgp14X680965

^{vi} Scanlon PH, Aldington SJ, Stratton IM. Delay in diabetic retinopathy screening increases the rate of detection of referable diabetic retinopathy. *Diabet Med* 2014;31(4):439-42. doi: 10.1111/dme.12313 [published Online First: 2013/10/08]

^{vii} Scanlon PH AS, Leal J, Luengo-Fernandez R, Oke J, Sivaprasad S, et al. Development of a cost-effectiveness model for optimisation of the screening interval in diabetic retinopathy screening. *Health Technol Assess* 2015;19(74)

Diabetes eye care awareness training for primary level clinicians in Fiji



INTEGRATION TYPE

Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines

TARGET POPULATION

 1) Primary level clinicians, which include community health nurses and some general practitioners and nurse practitioners

 2) Individuals over the age of 35 who are at greater risk of diabetes and diabetic retinopathy

SETTING

 Income Group: Upper middle income, Region: Nationwide - rural and urban

IMPACT

 382 primary level clinicians trained

PROJECT BUDGET

 USD \$41,000

PROJECT TIMELINE

 Commenced 2015
– continuing

AUTHORS

The Fred Hollows Foundation New Zealand: Grace Johnstone, Programme Analyst; Prarthana Dalmia, Diabetic Retinopathy Programme Coordinator; Komal Ram, Pacific Diabetic Retinopathy Programme Manager. Pacific Eye Institute (PEI), Suva, Fiji: Dr. Bui Sikivou, Director and Lead DR Ophthalmologist

ACKNOWLEDGEMENTS

The Queen Elizabeth Diamond Jubilee Trust, Fiji - Ministry of Health and Medical Services

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) DR Training for Primary level clinicians
- 2) Development of the DR training facilitators' manual

SOURCE OF FUNDING:

The Queen Elizabeth Diamond Jubilee Trust

ABOUT THE CASE STUDY

The problem

A study by Brian et al. (2010) found that the prevalence rate of diabetes, adjusted for ethnicity, age, and gender, in Fijians aged 40 years or older was 41 percent. Approximately 60 percent of people with diabetes in Fiji are undiagnosed (Brian et al. 2011). Inequities in terms of geographic area, have also been identified in Fiji, with those living in rural areas also less likely to have their diabetes diagnosed (Brian et al, 2011). Every person with diabetes is at a risk of developing diabetic retinopathy (DR). Since DR is often asymptomatic and many patients are not even aware they have diabetes, it is imperative to ensure patients are diagnosed and referred timely for retinal screening.

The Fred Hollows Foundation New Zealand (FHFNZ), in consultation with the Ministry of Health and Medical Services Fiji, has been working to strengthen and expand DR screening and treatment since 2011, including the delivery of postgraduate training programmes in eye care for nurses and doctors at the Pacific Eye Institute (Ramke et al., 2012).



Photograph Copyright: The Fred Hollows Foundation NZ

Outstanding barriers to diabetic retinopathy management include a lack of appropriate resources in health centres, and primary level clinicians' limited knowledge of diabetic retinopathy management and diagnosis (Kool et al., 2015). Given that in most cases primary level clinicians such as community health nurses are the first point of medical contact for patients, it is important to acknowledge them as pivotal players in diabetes management and train them in diabetes eye disease and referral pathways to eye clinics.

Overview of the intervention/program

With the help of The Queen Elizabeth Diamond Jubilee Trust, FHFNZ developed and launched a programme to upskill 80% of community health nurses in DR in late 2015. The aim of the programme was to provide competency based training designed to build knowledge and skills in the area of diabetes and DR prevention and management.

Intervention/program details

The DR awareness training is provided to primary level clinicians including community

health nurses, ward nurses, reproductive nurses and some general practitioners. The training has been conducted across all divisions in Fiji over a 2 day workshop facilitated by the in-country Diabetic Retinopathy Coordinator, a senior nurse employed by PEI to implement DR activities. Supported by the lead ophthalmologist, training covers diabetes management, DR awareness, screening and management, visual acuity testing, referral pathways, use of DR referral forms and DR data management. During these workshops, the participants are provided with essential course equipment such as Snellen charts, occluders, referral forms and health promotion material such as IEC pamphlets. Further infrastructural support is provided through the provision of essential diagnostic equipment such as the HbA1c machines in some of the NCD clinics.

A DR Practice Manual titled "Diabetes and The Eye" was developed by PEI in 2017 for the purpose of eye care education for primary level clinicians. This manual is a valuable training resource that assists primary level clinicians in developing competencies to:

- Conduct eye screening assessment for diabetic patients
- Identify and manage other basic eye conditions
- Implement standard management guidelines for eye care
- Advise patients about diabetes eye care and promote health education in communities

IMPACT AND LEARNING

What was the impact and why did it work?

Since the programme commenced in 2015, 382 primary level clinicians have been trained, including over 75% of the target community health nurses. An evaluation of the programme demonstrated a highly positive response with an average of 96% of respondents rating the training as either 'Excellent' or 'Very good' across several measures.

"The more knowledge we have the better for the community because we will be disseminating the right knowledge and information for them to understand and to come forward."

Between 2014 and 2017, there was a 58% increase in the number of new diabetic patients screened by the PEI diabetes outreach programme in the health centres and specialist outpatient department clinics at sub divisional hospitals surrounding Suva, Fiji.

Factors contributing to the programme's success include:

- Established referral pathways throughout the country, including a skilled eye care workforce capable of screening and treating DR.
- Locally led training, delivered by a combination of NCD nurses, eye care nurses and ophthalmologists.

While the primary objective of the programme was to increase awareness and referrals for DR, the training curriculum was much broader, including general diabetes and eye care, to leverage this opportunity further.

Challenges and learning

Our DR Coordinator faced challenges organising the workshops and ensuring nurses

were released from their positions to attend the trainings. To overcome this challenge, it was important that these workshops were locally led. The DR coordinator was able to utilise her existing networks to advocate for this programme to nurse managers and NCD groups. It is a continuing challenge to ensure the nurses have ongoing support and resources to implement their learnings. The DR coordinator has facilitated the distribution of additional equipment and materials to participants and promoted further professional development opportunities including refresher training.

The training programme was designed in Fiji and formed the basis for the development of the Pacific DR Practice Manual. This was hugely valuable for the roll-out of the programme to other Pacific Island countries, now delivered in 5 other countries, and was vital to ensure a consistent standard of quality education regionally. The manual provides the basic curriculum which local DR Coordinators can adapt to their own country context.

Recognising knowledge gaps in their colleagues, the participant nurses recommended that the training be available to other tiers of the workforce, including more general practitioners and community health workers. The programme has now been modified for content and the DR coordinators have commenced training of community health workers.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

The management of diabetes is a 'whole of life' task and requires an integrated approach operating from the prevention of the disease to its management across acute and chronic stages. To address the current gaps in diabetes eye care across the region, the DR awareness training of primary health clinicians enable this cadre to work in collaboration with diabetes services to support and refer diabetes patient to access specific point of care, screening and treatment services. This effort to strengthen the referral system aims to streamline care and work within the current standards of diabetes service delivery in each country.



DR screening in rural district

International Case Studies of Integrated Care for Diabetes and Eye Health

Integrated Models of Care for Diabetic Retinopathy in India

INTEGRATION TYPE

Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines

TARGET POPULATION

 People with diabetes and registered at Non Communicable Disease Clinics

SETTING

 Income Group: Lower middle income; Region: Rural – 10 districts – Vijayanagaram(Andhra Pradesh), Surat(Gujarat), Goa (Goa), Tumkur (Karnataka), Trissur (Kerala), Wardha (Maharashtra), Khurda (Odisha), Pali (Rajasthan), Tirunelveli (Tamil Nadu), West Midnapur (West Bengal)

IMPACT

 34,450 people with diabetes screened

PROJECT BUDGET

 USD \$3.25 million

PROJECT TIMELINE

 March 2015 and the end date is June 2019

AUTHORS

International Centre for Eye Health, Clinical Research Department, London School for Hygiene & Tropical Medicine: Murthy GVS and Clare Gilbert; Indian Institute of Public Health, Public Health Foundation of India: Rajan Shukla

ACKNOWLEDGMENTS

India DR Partners Project Implementation Consortium; The Queen Elizabeth Diamond Jubilee Trust

PROJECT EXPENDITURE – PRIMARY COSTS

- 1) Equipment
- 2) Project Costs (transport, staffing, monitoring, etc.)
- 3) Training
- 4) Advocacy

SOURCE OF FUNDING:

The Queen Elizabeth Diamond Jubilee Trust. Physical space, staff providing the services, medicines, and operating expenses were met by the respective State Governments where the project was implemented.

ABOUT THE CASE STUDY

The problem

PwDM registered at the recently operationalized NCDC at Primary Health Centres (PHC) (1:30,000 population) and Community Health Centres (CHC) (1:100,000 population) are provided free diabetic medications. No systematic screening program for detection and management of DR exists at these clinics. Opportunistic screening for DR is available at some eye clinics at secondary or tertiary level. Two separate public-funded programs, the National Program for Prevention and Control of Cardiovascular Diseases, Cancers, Diabetes and Stroke (NPCDCS) and the National Program for Control of Blindness (NPCB) are involved in diabetes management and eye care, respectively. Managing diabetes and its complications need an integrated approach at all levels of care to optimize benefits.

Overview of the intervention/program

The public health system ensures long

term sustainability as it meets the needs of the poor, especially women in rural areas, for whom accessing private facilities is unaffordable. Only a public-funded health system can ensure that services will continue to be provided to all segments of the population in an equitable manner. A situational analysis revealed that 45% of the PwDM had some degree of visual loss when they first presented to an eye clinic. Therefore, a paradigm shift was essential where PwDM are offered screening at a physician's clinic, before vision loss occurs.

The objectives of the project included developing integrated sustainable services through:

- advocacy for policy change with the government
- capacity building of ophthalmologists and physicians
- orientation of auxiliaries (making them aware of complications of diabetes and the need for early screening for eye complications to prevent visual impairment)
- increasing awareness on risk factors and their management by PwDM
- implementation and evaluation of integrated models of care for DR in 10 pilot districts.

Operational feasibility and benefits of the integrated model, embedded in public health systems is currently being assessed.

Expected outcomes include 50% increase in screening for DR among clinic-registered PwDM, 75% registered PwDM aware of the risk of STDR and 50% increase in known PwDM attending for repeat annual screening.

Intervention/program details

The Ministry of Health, Government of India constituted a task force, which shortlisted districts based on diabetes magnitude, functioning NCDC availability, and mentors to support capacity building. Agreements were signed with the respective governments to ensure sustainability and scaling up. Physicians, ophthalmologists and ophthalmic assistants were skilled. Public health facilities were supported with equipment. Customised software was developed to track registered PwDM. Advocacy with the different stakeholders was critical for getting their buy-in. Regular monitoring and reviews provided quality assurance.

IMPACT AND LEARNING

What was the impact and why did it work?

Integration of the two vertical programs (NPCB and NPCDCS), ophthalmologists and diabetic physicians, public health and the NGO sectors and different levels of care were facilitated by the core planning and monitoring team and the implementing partners. This included sharing evidence on how partnerships would improve uptake of screening services and ensure follow up and the need for a team approach rather than an individual speciality. Screening was initiated in the physician's clinics across 50 CHC across 10 States. Treatment facilities were augmented at 10 district hospitals. Review meetings provided important insights into implementation. 480 health professionals were trained and 3153 auxiliaries oriented. 34,450 known PwDM were screened and 1601 treated in the first two years which matched the expected outcomes. Six State governments have allocated finances for scaling up DR screening in districts not covered by the pilot.



Challenges and learning

In many States, signing the agreements took time. Eleven States were initially identified, but one State had to be dropped as it was taking inordinately long to get them on board. The initial reluctance of providers to support task-sharing and the lack of structured follow up mechanisms were challenges. The competing priorities with other health programs were also a challenge as was availability of affordable Anti-VEGF agents. In many districts, initially, dedicated personnel and space for the NPCDCS clinic was not available. In some States, coordination hampered scaling up.

The pilot also provided key learnings. Government buy-in is critical for success and sustainability. Once the governments are convinced of the benefits, there is enthusiasm for scaling up DR screening activities. Time needs to be invested in building trust, confidence and understanding among the different stakeholders to work together if integration is to be achieved. PwDM have to be supported through mediums like peer groups so that they can act as advocacy pressure groups.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?

Diabetes affects the poor as much as the rich. In rural areas, the poor, especially women do not access DR screening services because of affordability and the distance they need to travel. An integrated approach improves access to diabetic medicines and control of risk factors while providing services for screening of complications of diabetes, including DR. This will reduce the risk of visual loss in diabetes and meet the needs of rural populations where such facilities are not routinely available. There is a need to empower persons with diabetes also as compliance with medical advice and lifestyle modifications will only be successful if people are aware and willing. A pilot project spread across 10 districts in India showed that an integrated service delivery model for management of diabetes and its complications is feasible, pragmatic and acceptable to the providers and persons with diabetes.

Addressing Diabetic Retinopathy in Indonesia



DR screening activity during a World Diabetes day event

INTEGRATION TYPE

Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines

TARGET POPULATION

 People with diabetes across Indonesia (aged 15 years and above)

SETTING

 Income Group: Lower middle income; Region: Urban and rural districts within the provinces of Jakarta, Bandung and Yogyakarta

IMPACT

 The Ministry of Health has included vision assessment in screening tools for early detection of risk factors for non-communicable diseases including diabetes

PROJECT BUDGET

 USD \$325,000

PROJECT TIMELINE

 2015 – 2018

AUTHORS

Helen Keller International: Dr. Satyaprabha Kotha; Ame Stormer; Nick Kourgialis; Michael Lynch

ACKNOWLEDGEMENTS

Divisions of Diabetes and metabolic disorders and Disorders of the senses, Directorate of Non-communicable diseases, Directorate of Primary Health services and Directorate of Referral services, Ministry of Health

NCDs unit, Provincial and District Departments of Health in Bandung, Yogyakarta and Jakarta.

Rumah Sakit Cipto Mangunkusumo, Rumah Sakit Dr. Sardjito, Rumah Sakit Mata Cicendo.

Professional associations of Ophthalmologists and Endocrinologists

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) Advocacy
- 2) Screening Activities
- 3) Training

SOURCE OF FUNDING:

World Diabetes Foundation

ABOUT THE CASE STUDY

The problem

Indonesia has the one of the largest number of people with diabetes (PWD) in the world - an estimated 10,276,000 million people in the year 2017 which is expected to increase to over 16 million by the end of 2040ⁱ. Globally, the prevalence of diabetic retinopathy (DR) among PWD is estimated to be 34.6%ⁱⁱ which, if applied to Indonesia, means that over 3.5 million Indonesians with diabetes currently have DR and an estimated 5.5 million Indonesians will have DR at the end of 2040.

Early detection through development of screening programs and provision of appropriate treatment is critical to reduce visual impairment and blindness due to DR.

Overview of the intervention/program

The objectives of the DR screening program were to develop a strategy to integrate DR care into national standards of care for PWD in Indonesia and to improve the awareness of



General practitioners, nurses, educators and ophthalmologists to screening, referral and treatment for DR.

Intervention/program details

The key features were:

1 Screening services for DR at the primary health centres (PHCs) in the three provinces was carried out in partnership with the tertiary hospitals who provided the staff and the equipment while HKI facilitated training and the operational expenditure for the screening. The PHCs at the district were mapped and key staff from health offices were informed of the importance of DR screening. HKI-trained staff carried out the retinal photography, photo grading and education of PWD during every screening event. PWD identified with DR were referred to the secondary hospitals for further management. An ophthalmologist from each hospital was responsible for the DR screening program in their respective province.

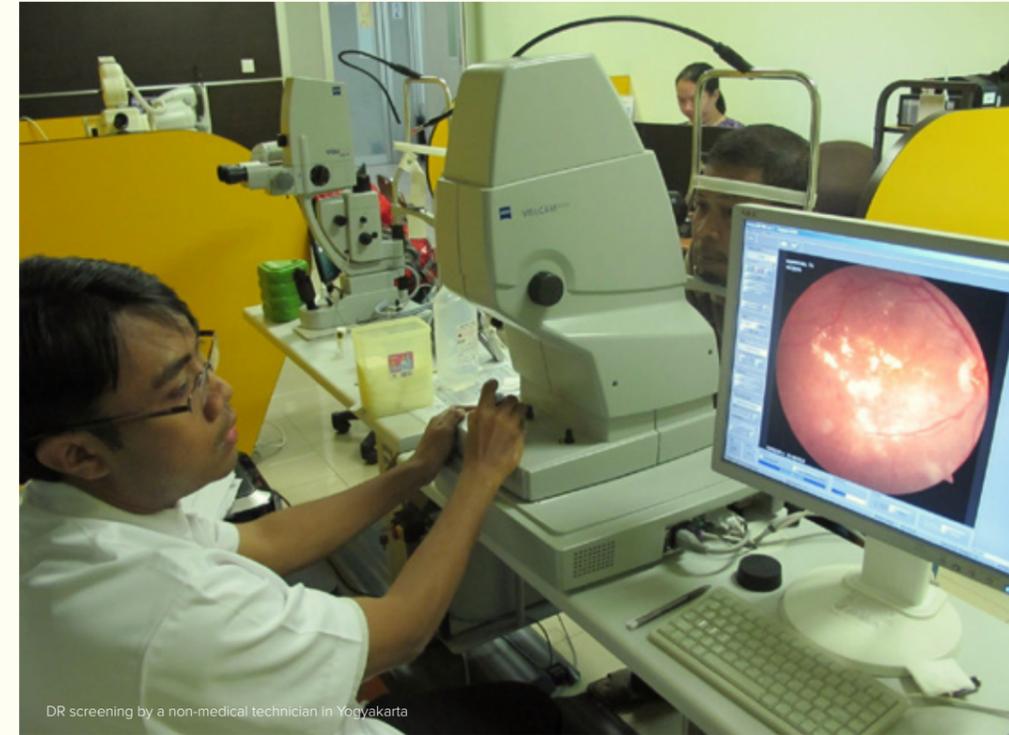
2 Advocating for the inclusion of DR screening into the National Guidelines for Care of Diabetes: A task force was established that recommended that DR screening guidelines be reviewed at the three

tiers of the health system, which could be used to inform policy change. HKI supported the development of these guidelines as well as the incorporation of DR messages into advocacy packages for dissemination to the provinces and the integration of modules for DR into national training modules.

IMPACT AND LEARNING

What was the impact and why did it work?

The MoH has now included vision and hearing assessment into screening tools for early detection of risk factors for NCDs such as Diabetes, Hypertension, Obesity, Heart Disease, Chronic Obstructed Pulmonary Disease and Cancer. This activity is carried out in accordance with MoH set guidelines, through the PHCs all over the country by health workers at integrated health posts in the communities called 'POSBINDU'. The screening kits include devices to test blood glucose, cholesterol, body fat, measure weight, waist and height, and vision. The target beneficiaries are ages 15 and above. Regular health check-ups are carried out by trained health volunteers supervised by staff at the PHC. Counselling to live a healthy lifestyle is also encouraged. Those identified with risk factors are then referred to the PHC



for further assessment.

The developed guidelines for screening of DR and the Information, Education and Communication materials have been shared with the MoH to incorporate DR screening into National guidelines of diabetes care and to improve awareness towards prevention of blindness due to DR.

Challenges and learning:

Since DR is typically asymptomatic in its early stages, using visual complaints as a pre-requisite for referral can result in delayed care and irreversible vision loss. Evidence from an operations research project carried out in Jakarta and Yogyakarta demonstrated that PWD served at the NCDs clinics in the PHCs were not referred to secondary hospitals for DR screening unless they reported visual complaints. In the selected intervention districts where vision assessment, fundus photography, and education were carried out for PWD, they were consistently referred to the secondary hospitals for further management when identified with DR. Most patients (84%) visited a hospital for further treatment when they received a referral note from their physician. An important challenge is that currently, the operational costs for screening

activities at the PHC by the tertiary hospitals cannot be recovered through the insurance system because such an outreach activity is beyond the mandate of the hospital. It would be most sustainable for the screening services at the PHC to be integrated into the health system, where costs can be recovered through the insurance system.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?

By inclusion of guidelines for screening for DR into the National standards of care for diabetes; provision of screening services for DR within the NCD clinics at the PHCs and education of health care providers at all the tiers of the health system, this case study demonstrates the integration of diabetes and eye health. Further, to ensure sustainability, the developed guidelines must inform change in policy to recover costs for screening for DR. Although this was beyond the scope of the program, constant advocacy will be continued to make this a possibility soon.

(<http://www.diabetesatlas.org/across-the-globe.html>)
(Yau et al Global Prevalence and Major risk factors of Diabetic Retinopathy Diabetes Care 35:556-564, 2012)



International Case Studies of Integrated Care for Diabetes and Eye Health

Modelling a Telemedicine Screening Program for Diabetic Retinopathy and Implementing a Pilot Project in Iran

INTEGRATION TYPE

Horizontal and vertical integration of services

TARGET POPULATION

 Patients with diabetes over 12 years of age and registered at the Iranian Diabetes Society - Islamshahr Branch (IDSIB)

SETTING

 Income Group: Upper middle income; Region: Urban, capital city suburb -Islamshahr

IMPACT

 604 patients screened

PROJECT BUDGET

\$\$\$ USD \$18,500

PROJECT TIMELINE

 Program modelled 2014 – 2016. Project implemented in 2017.

AUTHORS

Ophthalmic Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran (WHO Collaborating Center for the Eye Health and Prevention of Blindness Program in Iran); Center for Global Health, Department of Public Health, Aarhus University, Denmark. See end of case study for co-authors.

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This study was performed in collaboration with the New Technologies Research Center, Amirkabir University of Technology and Iranian Diabetes Society.

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) Equipment, developing the web-application and server
- 2) Staffing
- 3) Training

SOURCE OF FUNDING:

Ophthalmic Research Center affiliated to Shahid Beheshti University of Medical Sciences

ABOUT THE CASE STUDY

The problem

The burden of diabetes mellitus (DM) is high in Iran, rising by 35% among Iranian adult population from 2005 to 2011. Diabetic retinopathy (DR) is the most important ocular complication of DM and almost 30% of adult persons with DM suffer from this complication in Iran. Population-based studies indicated that DR is the leading preventable cause of visual impairment (VI) in the working age population. Evidence showed that early detection and timely treatment is an effective strategy to reduce VI attributed to DR. However, a noticeable percent of Iranian patients with DM are unaware of this important issue.

The WHO has designed a tool for assessment of DR and DM management systems known as WHO-TADDs. It makes situation analysis possible at the national level through a seven

section framework including 1) Priorities, policies and programs 2) Service delivery 3) Health workforce 4) Health technology 5) Health information management systems 6) Health promotion for DM and DR and 7) Health financing. The national WHO-TADDs assessment of Iran, headed by the Ophthalmic Research Center (as the WHO Collaborating Center for the Eye Health and Prevention of Blindness Program), demonstrated an appropriate status in terms of workforce and essential technologies for DR care. However, the analysis showed that integration of DM and eye care services and the screening coverage for DR needed to be promoted further.

Overview of the intervention/program

Telemedicine is an ingenious strategy to overcome the access barriers and increase the rate of screening by promoting the network between care providers in primary and referral care settings and improving the patients' awareness. The United Kingdom, the United States, France, Australia and India have reported successful tele-screening programs for DR. Despite the advantages of this approach, a tele-screening program has not been implemented yet in Iran.

Intervention/program details

In this mixed model study, a DR screening referral pathway and a web application called "Iranian Retinopathy Teleophthalmology Screening (IRTOS)" was launched. At the same time, an educational course for general practitioners (GPs) was established. To conduct the pilot phase, registered patients at the IDSIB were recalled. After admission at IDSIB:

- 1) patients were informed about the aims of the study and the procedure
- 2) written consent was obtained

3) visual acuity (VA) was assessed and the fundus images captured

4) fundus images were sent to the reading center at Ophthalmic Research Center, Shahid Beheshti University of Medical Sciences in the north of Tehran via IRTOS.

5) Images were graded by the trained GPs at the reading center. Images were also independently reviewed by a retina specialist as the gold standard at the reading center.

6) Finally, patients and the IDSIB were informed of the results via mobile text messages and the IRTOS, respectively.

7) Patients who needed further assessment were referred to an eye hospital.

IMPACT AND LEARNING

What was the impact and why did it work?

Overall, 604 subjects with diabetes were screened; of these, 415 (68.7%) were women. The retinal images had sufficient quality for grading in 93.5% of cases. The sensitivity and specificity for diagnosis of any stage of DR by trained GPs was 82.8% and 86.2%, respectively. Corresponding values were 63.5% and 96.6% for DME. The rate of sight-threatening DR was 15.5%. Half of the screened subjects needed to be referred for further evaluation. Totally 24.2% of patients did not comply with recommended further assessment.

Challenges and learning (what challenges did you face and what important lessons were learned):

- In our study, the majority of patients complied with the recommended further assessment. It may be explained by the

mobile text message usage for informing the patients. This method can be considered as an initial version of the mobile health (mHealth) which overcomes transport and cost barriers. The impact of the IDSIB staff in increasing the patients' awareness was another factor for high compliance rate. However, we learned that this rate may be increased further through raising the patients' awareness about the value of early detection of DR for prevention of severe visual impairment and blindness. In addition, this rate may even be increased by providing more diagnosis and treatment facilities.

- Most of the screened patients were women. This might be explained by the increasing access of women to the DR screening care facilities through overcoming the transport barriers.

- The sensitivity of DME grading by GPs was not appropriate enough. To compensate this limitation, VA assessment was included in the screening process and resulted in a high referral rate. Therefore, we decided to exclude patients with moderate non-proliferative diabetic retinopathy from the referral pathway. These cases would be followed by fundus photography based on a 4 month schedule.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

A tele-screening program for DR screening was designed in Iran and implemented in Tehran suburb.

- This model was focused on involving the primary care setting to promote the awareness of both patients and DM care

providers and to improve the network between DM and DR care services.

- The project resulted in two fundamental deliverables; a) A user friendly web application system in Farsi language for screening of DR in Iran; b) the Ministry of Health (MoH) approved training package for screening of DR to upskill GPs.

- The pilot phase findings revealed that grading by GPs had a high sensitivity and specificity for any stage of DR.

- Current model identified 50% of low risk diabetic patients who might be followed at the IDSIB as the primary setting and resulted in allocating more diagnosis and treatment facilities and resources to patients at a high risk of VI.

- The findings were reviewed at the Center for Non-communicable Diseases Control, MoH, to promote diabetic eye care services at the national level. This led to designing a new project that mostly focused on the integration of IRTOS into the ongoing national public health database (SIB) and also changing the approach of the DR screening training course into a distance learning model.

CO-AUTHORS

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Acquisition of images with Volk Pictor Plus® camera.

Screening for Diabetic Retinopathy in Mexico, Telemedicine: Pilot Project

INTEGRATION TYPE

Integration of eye care into routine diabetes care/primary care

TARGET POPULATION

 Adults 18 years of age and above with or without a history of systemic disease including DM

SETTING

 Income Group: Upper middle income; Region: Querétaro, Querétaro - urban

IMPACT

 24,402 eyes analysed in 78 different primary care clinics, in 23 out of the 32 states of the Mexican Republic

PROJECT BUDGET

 USD \$76,000

PROJECT TIMELINE

 December 2015 – May 2016

AUTHORS

Instituto Mexicano de Oftalmología, IMO, Querétaro (Mexican Institute of Ophthalmology). Dr. Renata García, Dr. Ellery López, Dr. Van C. Lansingh, Dr. Dalia Méndez, Dr. Alejandro Arias.

ACKNOWLEDGEMENTS

SEVA USA, Vision for the Poor, Singapore Eye Research Institute.

PROJECT EXPENDITURE - PRIMARY COSTS

1) Training at the Singapore Eye Research Institute and related costs

2) Server and computer equipment as well as development software

3) Portable, non-mydratric cameras

SOURCE OF FUNDING:

NGOs as listed above and own funding from the IMO

ABOUT THE CASE STUDY

The problem

Diabetic retinopathy is a leading cause of blindness worldwide and the main cause of visual disability between patients of productive age.

The overall prevalence of diabetic retinopathy of any severity is 34.6% globallyⁱ and the stages that cause visual threat such as proliferative diabetic retinopathy and macular edema can be asymptomatic, therefore, it is vital to carry out an appropriate, timely, easy to reproduce screening that does not generate an increase in medical care costs. We also conducted a Rapid Assessment of Avoidable Blindness (RAAB) study in 2016, which showed that we had a 1% prevalence of bilateral blindness and of which 18.8% was due to DRⁱⁱ.

Overview of the intervention/program

The objective of the intervention was to determine the prevalence of DR and other retinal diseases within the Mexican

ⁱ Yau JW, Rogers SL, Kawasaki R, et al. Global prevalence and major risk factors of diabetic retinopathy. *Diabetes Care* 2012;35:556–64.
ⁱⁱ López EM, Allison K, Limburg H, et al. Rapid assessment of avoidable blindness including diabetic retinopathy in Querétaro, México. *Rev Mex Oftalmol (Eng)*. 2018;92(2):70-79

population that participated in a telemedicine screening program.

Secondary objectives: determine the sociodemographic characteristics, prevalence of Diabetes and Hypertension, Diabetic Retinopathy, age related macular degeneration, suspicion of glaucoma, and prevalence of other fundus findings.

Hypothesis: is there similarity between the prevalence of diabetic retinopathy in our RAAB study to that reported. A screening program for diabetic retinopathy through telemedicine, could represent a cost-effective tool that allows detecting early stages of DR to establish timely treatment.

Intervention/program details

Health prevention campaigns in 78 different primary care units were carried out in several states of the Mexican Republic, where they recruited a total of 24,402 eyes. The analysis of the photographs was carried out at the reading center of the Mexican Institute of Ophthalmology in Querétaro, México: Mexican Advanced Imaging Laboratory for Ocular Research (MAILOR), between March 2016 and February 2018 through the program. To support this analysis, an electronic platform was designed for storage, transfer and evaluation of data and the generation of reports. The platform includes a questionnaire with personal and sociodemographic data, as well as medical and ophthalmic history. Optometrists were trained for this purpose, as well as for taking visual acuity (simplified E-test was used) and taking pictures (Pictor Plus® non-mydratic camera (Volk, Ohio, USA), 2 color photographs 40 degrees per eye were taken, one centered on the macula and the other in the optic disk.

The evaluation of images captured was

undertaken by a retinologist certified by the Singapore Ocular Reading Center (SORC) and The University of Melbourne in grading DR at the Melbourne School of Population and Global Health. The criteria for qualifying a photograph as non-gradable were: overexposure, or underexposure, dark areas, artifacts, and out of focus.

The modified Scottish classification of diabetic retinopathy was used. (NHS).

Suspect glaucoma was defined as: cup/disc ratio equal to or greater than 0.6 in any eye, disk asymmetry equal to or greater than 0.2, disc hemorrhages or any notching of the neuroretinal ring. After graduation of each eye, the system indicates a clinical recommendation from the Reading Center and the period in which ideally the patient should be assessed if required.

IMPACT AND LEARNING

What was the impact and why did it work?

A total of 12,201 people participated in screening from 78 clinics and hospitals located throughout México. Most of the studied population was concentrated in Mexico City, Guanajuato, Queretaro and the State of Mexico. The medium age was 61.31 years (18-98) and 66.26% were women. The prevalence of arterial hypertension was 53.04% (n = 3987). The prevalence of Diabetes Mellitus was 82.75% (n = 8279) and the average duration of the disease was 11.38 years (SD = 8.04). Only 4.61% of diabetic patients had follow-up with glycosylated hemoglobin (HbA1c). 48,804 fundus photographs were analyzed. 12.37% of the photographs were non-gradable. 12.56% (n = 1532) of the population presented corresponding findings with diabetic

retinopathy in at least one eye.

The prevalence of macular degeneration in this study was 5.61% and 5.7% with suspected glaucoma. 0.21% (n = 26) of the total patients had clinical findings of diabetic retinopathy and were not aware of diabetes mellitus.

Challenges and learning

When rolling out this program in several states of México, as a detection method for the entire population, there was difficulty in breaking distance barriers and acquiring non-mydratic cameras to avoid the possible complications of drug dilation.

A joint work was carried out in the institute to implement ophthalmological prevention campaigns and recruitment of patients.

Training of personnel such as optometrists for the capture of images and ophthalmologists and retinologists for the reading and evaluation of retinographies.

The implementation of the program showed a higher cost benefit when a screening diagnostic test was performed to detect diabetic retinopathy, as well as other retinal diseases.

CONCLUSION

The implementation of this program has ensured that adequate referrals are made for patients evaluated and that require treatment. The outcome being that the over saturation of health services is reduced.



Integrated Approaches to Address Diabetic Retinopathy in three Districts of Pakistan



Lady health workers educating women at the community level regarding DM and its effect on eye health

INTEGRATION TYPE

Horizontal and vertical integration of services

TARGET POPULATION

 57,103 known patients with diabetes across Karachi, Lahore and Rawalpindi in Pakistan

SETTING

 Income Group: Lower middle income, Region: Urban

IMPACT

 34,982 people screened for DR, 9,574 patients referred to partner hospitals (to date)

PROJECT BUDGET

\$\$\$ USD \$1.25 million

PROJECT TIMELINE

 April 2014 – March 2019

AUTHORS

Sightsavers Pakistan Country Office: Munazza Gillani, Country Director; Muhammad Bilal, Programme Manager; Leena Ahmed, Senior Programme Officer

ACKNOWLEDGEMENTS

Al-Ibrahim Eye Hospital Karachi, Holy Family Hospital Rawalpindi and Mayo Hospital Lahore.

National Eye Health Committee and National DR task Force Pakistan

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) Service Delivery Costs
- 2) Training of Doctors, Lady Health Workers, GPs, MOs, project team
- 3) Monitoring & Evaluation
- 4) Advocacy and Community Awareness
- 5) Research

SOURCE OF FUNDING:

Standard Chartered Bank through the 'Seeing is Believing' programme (80%) Sightsavers (20%)

ABOUT THE CASE STUDY

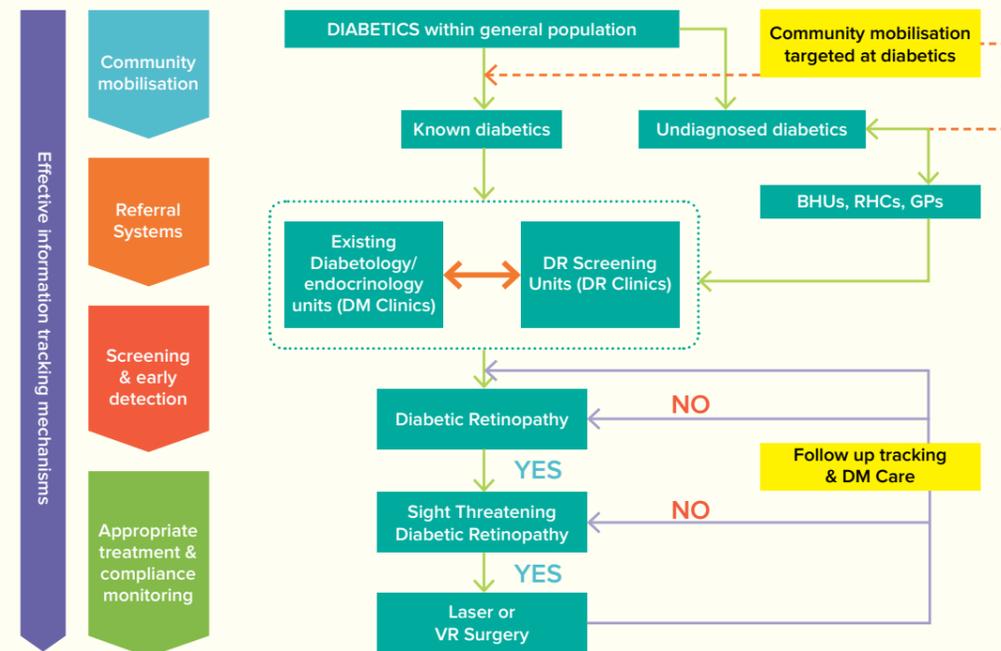
The problem

This case study is based on a project titled "Strengthening Pakistan's Response to Diabetic Retinopathy" designed and implemented by Sightsavers and funded by Standard Chartered Bank for a duration of five years (March 2014 to April 2019). Diabetic Retinopathy (DR) and Sight Threatening DR (STDR) are among the most common causes of blindness amongst Diabetes Mellitus (DM) patients in Pakistan. The International Diabetes Federation (IDF) ranks Pakistan at number seven globally for high rates of diabetes in the population, with prevalence estimated at 7 million in 2010 projected to increase to 11.5 million by 2025. Various population-based studies conducted in Pakistan suggest that approximately 25% of people with diabetes have DR, and 10% have STDR, around 94% of STDR will need Laser treatment/Intra Vitreal injections and about 6% will need advanced Vitro-retinal (VR) surgery.

Overview of the intervention/program

The overall purpose of the project is to prevent visual impairment due to DR through early detection, regular follow up and appropriate management of STDR amongst known persons with diabetes in the three districts of Pakistan. The key focus of the project is on developing a referral system from primary to secondary and tertiary level to ensure known diabetic patients are screened for DR and a management plan is established.

Multi-Disciplinary team approach for DR prevention and treatment and training of various medical cadres. This includes training of Ophthalmologists in vitreo retinal surgical skills and laser procedures. Moreover General Physicians (GPs) and Medical officers (MOs), Medical and Ophthalmic Technicians, and Lady Health Workers (key workforce of Pakistan's Primary Health Care system) working in the project areas have been oriented about DM and its complications on eye health.



Intervention/program details

Strong referral chain (primary to tertiary level) for screening of all DM patients for early detection of DR and its treatment. Cross referral within various departments (medical, endocrinology, diabetic clinics and ophthalmology) for screening of all DM patients to detect DR (if any³¹).

Robust IEC Strategy for demand generation and improved uptake of services for DM and DR.

Treatment compliance, through an effective tracking system and DR MIS that records referrals, screening, treatment follow up of people with diabetes. This MIS tracks the treatment compliance of patients especially

³¹ Within the project MIS, the information about source of referral is recorded for each patient, this enable us to determine different sources and numbers of referrals from primary level. LHWs are provided with referral slips (with 3 parts) one remains with LHW, one goes with patient and one is submitted at the project's partner hospital level. This mechanism helps in getting an insight on different types and ratios of referrals. Furthermore, it reveals that how many people were referred by LHWs and how many have actually reported to the facilities.

with STDR and is also capturing valuable data, which will provide information for further analysis and research purposes and wider learning.

IMPACT AND LEARNING

What was the impact and why did it work?

COMMUNITY MOBILIZATION FOR DEMAND GENERATION THROUGH PHC SYSTEM'S WORKFORCE: At the community level, 3,884 LHWs (Backbone of PHC system) were trained in spreading awareness regarding DM management and DR screening. LHWs have been an excellent tool for reaching out to women at the household level and as a result a good gender balance was achieved for women's access to DR screening/treatment services as reflected in the data captured.

The importance of DM management and its direct impact on the regression of the retinopathy was validated by project data analysis. The hospital selected for this analysis is purely an eye hospital where no DM management services available at start of this project. The hospital started providing DM management services in second year of this project and within three years, the progression from normal fundus to DR decreased from 13.57% to 10.04%, whereas the progression from DR to STDR decreased from 31.63% to 27.19%.

COMPLIANCE, RECAL AND REFERRAL: Treatment compliance for the visiting patients was achieved mainly through counsellors who counsel patients and their families to follow a regular treatment plan and secondly through the project-based patient tracking MIS software that is serving to record systematic patient data, details regarding management and follow up through automated cell phone SMS and reminder

emails to patients and project teams.

HEALTH SYSTEM STRENGTHENING and IMPROVED SERVICE DELIVERY: Training the existing community and health workers (Ophthalmic technicians and other para-medical staff) and specialist eye care workers, including ophthalmologists, who will leave behind a legacy of knowledgeable, skilled and committed human resources for the prevention and treatment of DR. The training materials developed for LHWs were endorsed by National Eye Health Committee and PHC system and are now part and parcel of the PHC system.

The project has equipped all three DR units with desirable technology and HR, which has helped in screening of 34,982 for DR, out of which 9,130 were identified with DR and 3,066 with STDR; 2,425 people were provided laser treatment and Intra-Vitreous injections; and 112 received VR surgeries under the project support free of cost.

HORIZONTAL and VERTICAL INTEGRATION of SERVICES for STRONG REFERRAL SYSTEM: Training MOs, Technicians and LHWs helped in developing a referral protocol from primary to tertiary levels of healthcare system, and as a result, 9,574 patients were referred from different sources and reported at partner hospitals during the last 4 years

To ensure that maximum DM patients reporting in hospitals undergo DR screening, inter-departmental linkages within hospitals were established. The patterns of referral practice are very variable within and between locations, and in some locations are still low considering the likely need within these communities.

Challenges and learning (what challenges did you face and what important lessons were learned):

- The existing underpinning health system for diabetes mellitus treatment services is not well established in project areas and each hospital is making efforts to overcome the particular constraints of the individual settings.
- Health facilities for different interventions should be selected closer to the available DR services, patient flow and easy access. Much larger number of diabetic patients can benefit, if the DR screening services are available nearest to the DM management facilities.
- One-Window operation with easy access was introduced at one partner hospital that enhanced patients' treatment compliance. It motivated patients significantly for uptake of treatment from registration to treatment.
- Awareness raising sessions organized nearer to communities through LHWs resulted in increased self-reporting and demand generation.
- A robust MIS system helped in follow up with patients to ensure treatment compliance and created evidence for research and advocacy.
- Building capacities of health professional at primary, secondary and tertiary levels is necessary for timely diagnosis and referral of DM patient for DR management that strengthen referral protocol.

Co-authors:

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CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

This case study provides an overview of the approaches used for integrated care of DM within eye health system, mainly:

- Adopting multi-disciplinary team approach and inter-departmental linkages for treatment of DR, resulting in a referral system and screening and examination of DM patients by all relevant medical professionals, including Diabetologist, Nephrologist, Medical Specialist, Optometrist, Ophthalmologist, VR/ Retina specialist, counsellor, diabetic foot clinic etc.
- Training of HR at primary, secondary and tertiary level to develop a referral protocol from community to tertiary levels.
- Effective treatment compliance through counselling and patients' data/tracking system, and introduction of one-window operation at hospital level for patient's facilitation.

Community awareness and advocacy with National Eye Health Committee and National DR working group for standardized guidelines for implementation of DR projects.

Comprehensive Model of Diabetic retinopathy Management in the Palestinian Territories

INTEGRATION TYPE

Integration of eye care into routine diabetes care/primary care

TARGET POPULATION

 Patients with diabetes (type 1 and type 2) attending clinics from all sectors in refugee camps, cities and villages in the West Bank in the Palestinian territories

SETTING

 Refugee camps, cities and villages in the West Bank in the Palestinian Territories which are considered a lower-middle income country

IMPACT

 40,000 patients screened

PROJECT BUDGET

 USD \$1.72 million

PROJECT TIMELINE

 November 2012 – December 2015

AUTHORS

St. John Eye Hospital Group

ACKNOWLEDGEMENTS

Fred Hollows Foundation, CBM, Federal Ministry of Economic Cooperation (BMZ) and Development, World Diabetes Foundation

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) Salaries
- 2) Medical Devices
- 3) Medications/ Medical and Surgical Disposables

SOURCE OF FUNDING:

Fred Hollows Foundation, CBM, Federal Ministry of Economic Cooperation (BMZ) and Development, World Diabetes Foundation

ABOUT THE CASE STUDY

The problem

Diabetes Mellitus and DR are major health problems in Palestinian territories. DM is projected to affect 23% of Palestinians by 2030 and highlighting the emerging issue of DR, in a clinic-based study in Ramallah, 37% of DM patients were identified to be affected by DR. Compounding this problem there, is an insufficient number of ophthalmologists to offer screening services to all patients at risk of DR across the Palestinian Territories. Despite these issues, DR was not a priority in the latest (2017) Strategic National Health Plan, and there is no national integrated DR screening program at primary health care level or any plans to improve the capacity of health care providers to screen for DR.

United Nations Refugees and Works Agency (UNRWA) is the second largest health provider in Palestinians territories. It offers health services to refugees who are the most vulnerable populations except for ophthalmic services.

St. John Eye Hospital Group (SJEHG) is the largest and the only expert provider of eye care in Palestinian territories with five facilities including hospitals in Jerusalem, Hebron and Gaza and clinics in Anabta (in

the north of Palestine) and the old city in Jerusalem. Because of restricted movement, many Palestinians cannot access SJEHG services.

Overview of the intervention/program

The objective was to introduce a workable, accessible DR screening model for DM patients in primary health care clinics from different sectors and to increase capacity of health care providers (non-clinicians) in DR screening. It also aimed to establish referral mechanisms between primary health care clinics and SJEHG facilities. UNRWA was the main partner in this project.

Intervention/program details

A semi-static model was used. Two screening desk-mounted fundus cameras (Canon-CX1) were stationed in primary health care clinics. One team screened DM patients in middle and northern areas of the West Bank and one team screened DM patients in southern areas to improve accessibility. Patients were screened in their respective clinics by trained nurses from UNRWA and SJEHG. When all patients in a clinic were screened, camera was moved to another clinic.

Screeners provided primary grading and referred patients with retinopathy or any eye abnormality to the closest secondary and tertiary SJEHG facilities for further management. Patients received comprehensive management by well-trained ophthalmologists and were followed up in coordination with their primary health care physicians. Quality control measures were conducted on regular basis to minimize false negative and false positive results.

Patients who needed complicated operations at the main tertiary hospital in Jerusalem were given appointments to apply for permits from the Israeli authorities as every

Palestinian living in the West Bank and Gaza needs a special permit to enter Jerusalem. In general all patients are given permits for treatment at St. John hospital except for very few patients who are denied permits for security reasons.

The program was conducted between November 2012 and April 2016 and the costs for refugees to access these services were covered by the project.

IMPACT AND LEARNING

What was the impact and why did it work?

The main impact of the project was establishing a real partnership with UNRWA and introducing a systematic DR screening program at the primary health care level. Importantly, it was the first well-established comprehensive screening project in Palestine.

Cameras were donated to UNRWA and the Palestinian Ministry of Health. 30 trained UNRWA nurses screened DM patients after the end of the project in different UNRWA clinics. Patients with retinopathy were referred for further management to SJEHG facilities.

As a result of the establishment of the screening project at UNRWA clinics, the numbers of referred patients to the SJEHG facilities decreased and only complicated cases were referred which improved the efficiency of the group's services.

Over 40000 patients were screened in all across 33 clinics through this program. This is believed to be the largest number of patients ever screened in any screening program in the world. One third was found to have DR and was referred to SJEHG facilities for further management. Thousands

of patients received different types of management and treatment. This contributed to improving the well-being and the quality of life of Palestinian DM patients by discovering and treating their DR at an early stage and preserving their sight.

Management and treatment modalities that the patients received

Laser	Avastin	Phaco	Vitrectomy	OCT	FFA
3104	1357	426	97	1,719	2381

Challenges and learning

- Successful screening should be undertaken through community-based national programs
- Using a desk mounted camera was not practical (very expensive, heavy, required continuous maintenance and was difficult to move from one clinic to another). Hand-held cameras might be a better option.
- While the partnership with UNRWA (as service delivery agency) was very successful, improved involvement and partnership with the Palestinian Ministry of Health is required to ensure the scalability, sustainability and financial security of the approach going forward.

CONCLUSION

The prevalence of DR among DM patients in the West Bank was high. As a result, early screening for DR and timely management is essential to preserve patient's sight and improve their quality of life.

Screening using fundus cameras by well trained nurses at the primary health care level can decrease number of referred DM patients to secondary and tertiary health facilities and increase the efficiency of these facilities.

Partnership with UNRWA was very important for the success of the program and for planning future projects. We hope to work on a national level and involve Palestinian Ministry of health despite all obstacles.

At the completion of the project, one fundus camera was donated to UNRWA and one was donated to the Palestinian Ministry of Health to continue screening patients and to integrate screening activities at primary health care facilities.





Orbis Trujillo FEH 2014 Program – Week 2.

Retina. Dr. Gary Lane, volunteer faculty retinal specialist from San Antonio, Texas, examined patients at IRO during week 2 of the program.

Credit: Geoff Oliver Bugbee/Orbis

International Case Studies of Integrated Care for Diabetes and Eye Health

Implementing an Integrated Diabetic Retinopathy Health System Model in La Libertad, Peru

INTEGRATION TYPE

Integration of eye care into routine diabetes care/primary care

TARGET POPULATION

 An estimated 54,841³² people with diabetes ≥30 years old within the catchment area of Instituto Regional de Oftalmología, two regional Ministry of Health hospitals and 12 health centres in La Libertad

SETTING

 Income Group: Upper middle income, Region: La Libertad Region

IMPACT

 11,849 patients with diabetes screened, 426 medical practitioners trained

PROJECT BUDGET

\$\$\$ USD \$2.345 million

PROJECT TIMELINE

 January 2014 – December 2017

AUTHORS

Orbis International: Amelia Geary, Director of Program Quality and Development; Sara Benavent, Senior Program Manager

ACKNOWLEDGEMENTS

IRO: Dr. Nancy Suarez.

PROJECT EXPENDITURE – PRIMARY COSTS

- 1) Equipment
- 2) Medical supplies
- 3) Training, staffing and professional fees

SOURCE OF FUNDING:

Orbis International and IRO (a public hospital funded by the Ministry of Health)

ABOUT THE CASE STUDY

The problem

The International Diabetes Federation reported a prevalence of diabetes of 5.2% for Peru in 2017, among whom an estimated 23.1% to 30% have DR, and who are twice as likely to be blind as those without diabetes.³³ Although access to health services in Peru has improved, there are still challenges for many people, especially for low-income and rural populations³⁴. IRO is in Trujillo, the capital of La Libertad, and provides high quality, comprehensive ophthalmological services for patients with limited resources.

Overview of the intervention/program

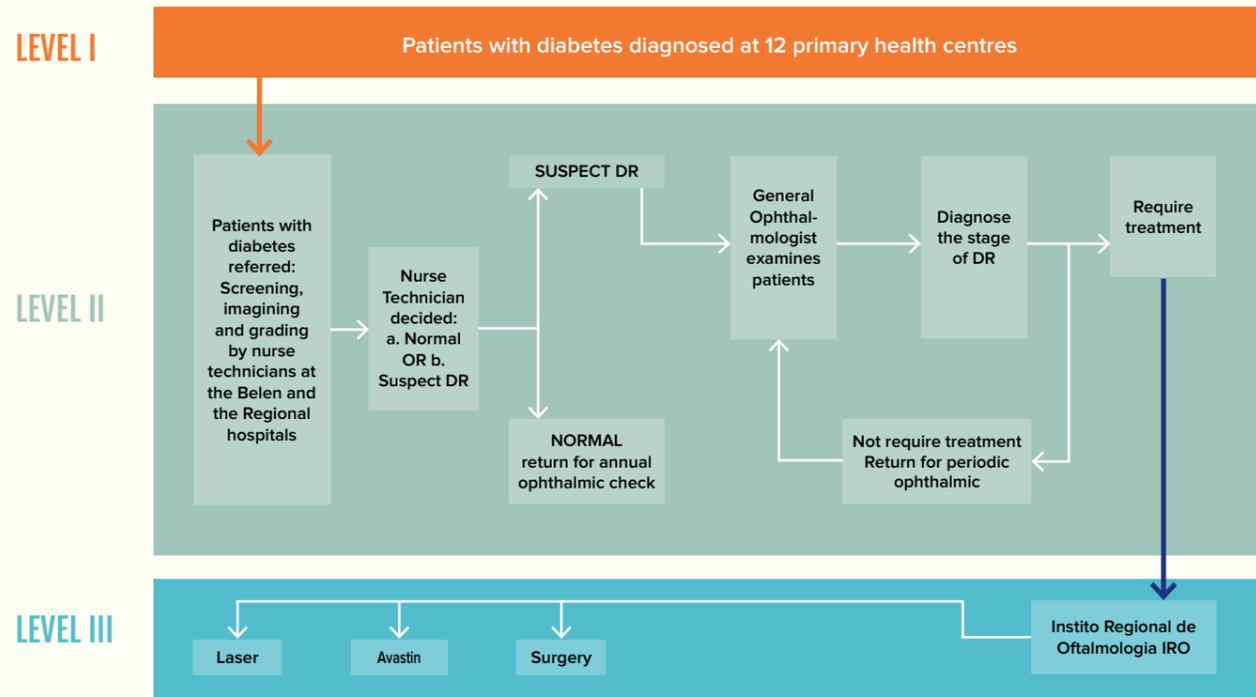
The implementation of a program for early detection and timely referral of patients with DR was the result of an agreement between Orbis and IRO in 2014. Project objectives include:

1 To provide access to ocular care, early assessment and timely treatment to the low-income population with diabetes.

2 To establish a care network including IRO (tertiary level), two regional hospitals (secondary level) and 12 public health centers (primary level) for the referral of patients with

Target population at time of project design 2013	N ^o	Estimated Percentage
Total Population in La Libertad	1,814,276	
Population projected La Libertad > 30yo	783,445	
DM Prevalence* (for testing in Health centers)	54,841	7%
Diabetes diagnosed* (require annual eye exam)	27,420	50%
People with diabetes who will develop DR	16,452	30% DM

³² (*) calculated based on ALAD, Guide4
(**) additional info based on Chiapas RAAB13
³³ Villena JE, Yoshiyama CA, Sánchez JE, Hilario NL, Merin LM. Prevalence of diabetic retinopathy in Peruvian patients with type 2 diabetes: results of a hospital-based retinal telescreening program. Rev Panam Salud Publica. 2011 Nov;30(5):408-14.
³⁴ Neelsen S, O'Donnell O. Progressive universalism? The impact of targeted coverage on health care access and expenditures in Peru. Health Econ. 2017 Dec;26(12):e179-e203. doi: 10.1002/hec.3492.



DR for screening, evaluation, diagnosis and treatment, if required.

3 To strengthen the technical capacity of the medical teams within the network, providing adequate training to improve the efficiency and quality of DR services.

Intervention/program details

IRO and Orbis advocated with the Regional Health Directorate to obtain a signed agreement to establish the DR screening network, in accordance with national regulations³⁵ and international recommendations³⁶.

During the first year of the project (2014) three non-mydratic cameras were acquired for retinal screening and a laser for DR treatment, all supported by Orbis. The cameras were installed at secondary and tertiary hospitals, and a pathway was established to refer all patients diagnosed with diabetes for an ophthalmological examination and treatment if required (see Figure below).

Multidisciplinary training was provided for staff at primary and secondary facilities, focusing on management of DM and screening of DR through the capture and grading of retinal photos. Training at the

tertiary level focused on building the capacity of retina specialists to deliver different modalities of treatment for DR.

IMPACT AND LEARNING

What was the impact and why did it work?

The collaboration between Orbis and IRO has successfully established an efficient DR referral system

which has increased the number of PWD who have received eye examinations, accurate referrals and timely treatment for DR. This project demonstrates that effective management of DR is possible when education, screening and treatment are fully integrated into the general health care system.

A total of 426 medical professionals were trained by the project, including 323 general physicians, 27 ophthalmologists, 29 residents, 30 nurses and 17 technicians. Between 2014 and 2017, 11,849 patients with diabetes were screened with non-mydratic cameras through the DR network. DR screenings in the area increased by 138.1%, from a baseline of 4,977 patients screened only at IRO over the period of 2010 - 2013. Nearly half of those screened in the project (5,632, 47.5%) were low-income patients attending public health centers.

³⁵ National Health Strategy for the prevention of NCD launched in 2004

³⁶ International Council of Ophthalmology Guidelines for Diabetic Eye Care available from <http://www.icoph.org/downloads/ICOGuidelinesforDiabeticEyeCare.pdf> (Cited 2018 Mar 03)

	Population Projected >30yo (SIS)	Cumulative nominal census 2014–2017 of registered patients with diabetes	No. of new patients screened for DR at referral hospitals	No. of Follow-up patients screened for DR at referral hospitals	No. of patients treated at IRO
Alto Trujillo	4,002	217	141	38	12
Ascope	2,039	428	267	78	37
Cruz Wilca	3,458	499	283	81	16
El Esfuerzo	6,114	577	354	123	22
El Milagro	5,021	473	332	125	36
Jerusalén	11,667	787	685	273	94
La Noria	33,649	939	818	271	74
Laredo	3,351	393	196	97	23
Santa Isabel	9,902	693	487	151	53
Virú	5,427	341	154	26	19
Vista Alegre	6,193	491	369	113	40
Wichanzao	2,994	174	118	52	15
Total	93,817	6012	4204	1428	441

Table 1. Cumulative census 2014–2017 of registered patients with diabetes at all levels of care in the diabetic retinopathy referral network in northern Peru, by primary health-care centre

The project ended in December 2017. Currently IRO is conducting their standard DR screening and treatment work, as well as liaising with the DR network. A project evaluation is being conducted and plans for a next phase being considered.

Challenges and learning

A comprehensive treatment network for DR requires ocular care to be integrated into every level of the healthcare system, supplying staff with the appropriate knowledge, skills and infrastructure to diagnose, refer and treat DR. Besides ophthalmic services, the network must include health professionals of all disciplines, including doctors specializing in general medicine and endocrinology, nurses, technicians, and counselors.

By employing multidisciplinary training strategies, advocating with the government and promoting public awareness and education, the DR referral network increased the screening and treatment of patients with diabetes, without placing undue strain on resources at specialized facilities.

However, the challenge remains to ensure the sustainability of the DR referral network over time.

Our experience suggests that programs

implemented to reduce the burden of DR must be planned with a horizon of 10 years³⁷, ideally with the input of diabetes educators³⁸, meaning that additional phases of the project may be required to sustain results.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?

This project proved the following:

1 Effective and timely treatment for DR is possible when patient education, screening and care are fully integrated into the general health care system across primary, secondary and tertiary levels.

2 This integration requires that health professionals at primary, secondary and tertiary health centers are furnished with the appropriate knowledge, skills and infrastructure to diagnose, refer and treat DR.

3 Besides ophthalmic services, the network must include health professionals of all disciplines, including doctors specializing in general medicine and endocrinology, nurses, technicians, and counselors.

³⁷ A second phase of the project is required to improve the referral systems, information management, and demand of services. Ten years represents the average length of time that is required to establish a functional and efficient DR program, which ensures DR awareness raising and preventative education amongst the target population
³⁸ Von-Bischoffshausen FB, Castro FM, Gomez-Bastar P. Planning diabetic retinopathy services - lessons from Latin America. Community Eye Health. 2011 Sep;24(75):14-6.



PEC optometrist conducting slit-lamp examination

International Case Studies of Integrated Care for Diabetes and Eye Health

Evidence-Based Shared Care Eye Model: Right Siting Of Stable Diabetic Retinopathy Patients To Primary Eye Clinic In Singapore

INTEGRATION TYPE

Integration of diabetes care into comprehensive/primary eye care

TARGET POPULATION

 Patients with Type I or Type II Diabetes; Age Group (21-85 years); referred to tertiary eye hospital (SNEC) for management of diabetic retinopathy with stable low risk DR

SETTING

 Income Group: High income; Urban

IMPACT

 Out of all cases of screened for DR in the Singapore Integrated Diabetic Retinopathy Programme, up to 10% of the patients are currently managed in tertiary hospitals. With the implementation of this step down care model, 6-8% of cases are decanted to Primary stable eye clinic in SNEC.

PROJECT BUDGET

\$\$\$ USD \$419,857 PER YEAR

PROJECT TIMELINE

 2013 to ongoing

AUTHORS

Singapore National Eye Centre (SNEC)
Singapore Eye Research Institute
Duke-NUS Medical School

ACKNOWLEDGEMENTS

Dr Ranjana Mathur, Clinical Director, Primary Eye Care, SNEC, Prof Tien Y Wong, Medical Director, SNEC, Prof Donald Tan, past Medical Director, SNEC, and PI of the PEC research project, Mr Lee Kai Yin, Chief Project Officer, SNEC. Ms Charity Wai, Chief Operating Officer, SNEC. Adj A/Prof Edmund Wong, Dy Medical Director, Clinical Service, SNEC. Adj Asst Prof Dirk De Korne, Health Services and

SystemsResearch, Duke-NUS Medical School, Prof Ecosse Lamoureux, Health Services and Systems Research, Duke-NUS Medical School.

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) Training primary eye care staff
- 2) Manpower cost
- 3) Equipment and rental

SOURCE OF FUNDING:

SNEC

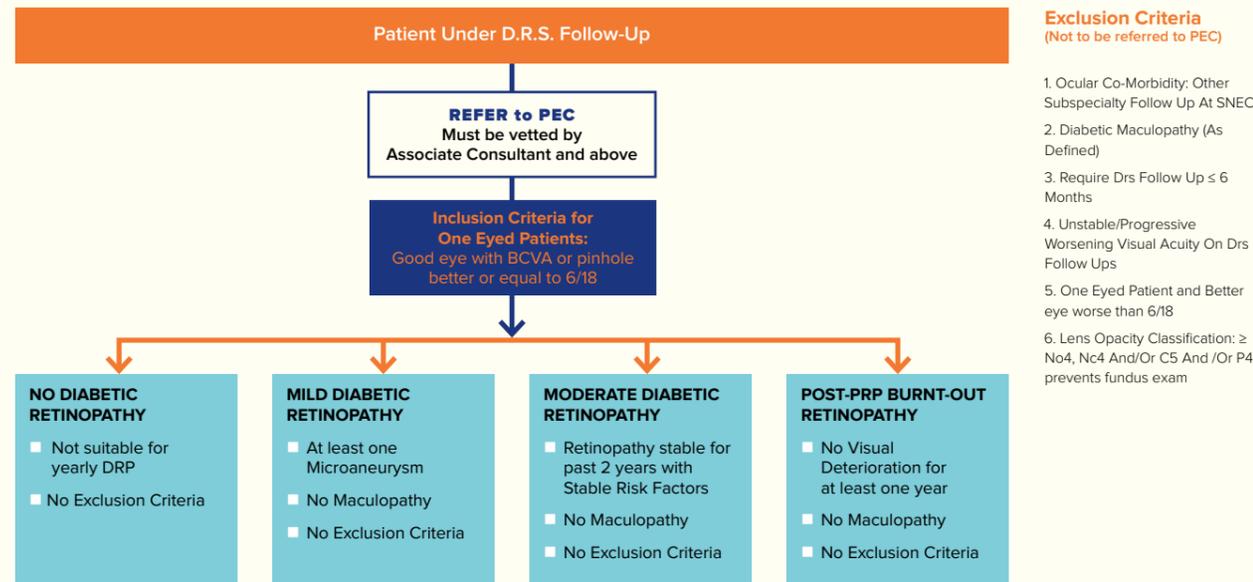
ABOUT THE CASE STUDY

The problem

Currently, public tertiary eye centres, and private ophthalmology clinics provide the bulk of eye care services in Singapore. Predicted increase in prevalence of type II DM in Singapore to 15% by 2050 will inundate specialist clinics with patients with diabetic retinopathy (DR). Of these only 25% or so may have vision-threatening DR that requires intensive specialist care. That leaves the bulk of DR patients with low risk of vision impairment, which may potentially be followed by primary eye care providers. However, overcrowded specialist outpatient clinics (SOC) have not been able to decant stable patients to polyclinics for long term care due to lack of clinical expertise to perform comprehensive eye examination in primary eye care (PEC) at the polyclinics in Singapore.

This has resulted in high retention rates of all grades of DR patients at SNECs general as well as specialist eye clinics with a mix of simple and complex cases. This reduced efficiency of SOC and could potentially result in less time devoted to complex cases.

Clinical Pathway for referral of Diabetic Retina Service (D.R.S) patients to PEC



Intuitively, due to already burgeoning SOC, new patients need longer waiting time to get specialist appointment. Patients requiring immediate eye care may have delayed access to eye care resulting in significant visual morbidity. This led us to develop an eye model of right-siting these patients to an appropriate location to be managed by a clinically competent team of medical professionals at the lowest possible cost.

Overview of the intervention/program

Due to lack of evidence whether primary care physicians in Singapore can provide similar quality of care with regard to diagnosis, management and patient satisfaction, at a reduced costs and we designed a study to look at these parameters.

The objective of SNEC PEC research project (2012) which conducted a randomized equivalence study was to compare quality of clinical care, patient satisfaction and economic benefits of managing patients with stable DR in a PEC, seen by trained primary care physician; compared with a tertiary SOC in SNEC. The primary outcome was correct clinical assessment and management, using a dichotomous masked tick box approach according to attending retinal specialist ophthalmologist. Secondary outcomes were patient satisfaction and consultation costs. Equivalence testing was used to analyse generalized odds ratio and associate confidence intervals.

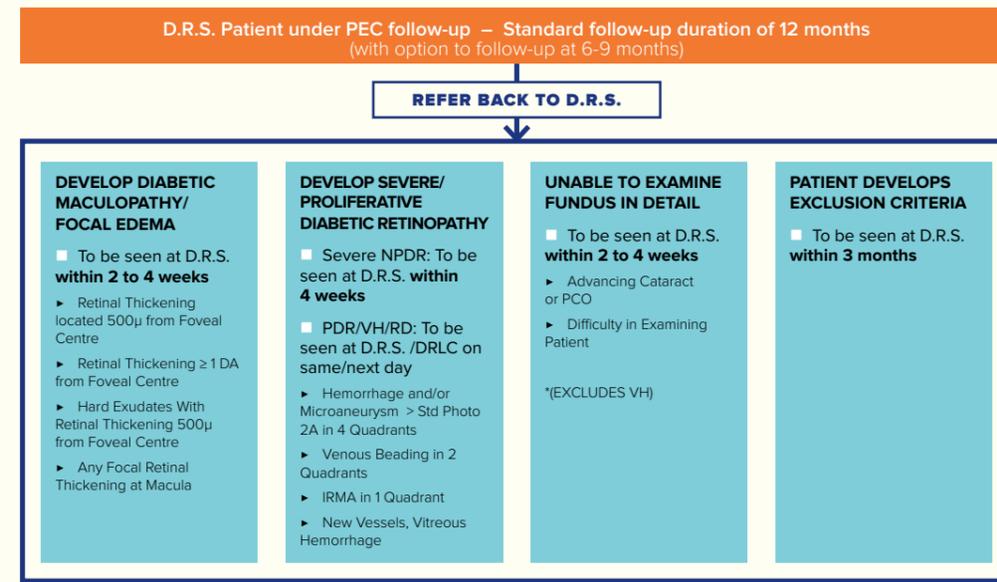
Intervention/program details

We developed a stringent training program, referral clinical pathway and protocols for stable DR, based on strict inclusion/exclusion criteria. Stable DR patients included those with stable condition at the SOC for at least 2 years, diagnosed with mild to moderate NPDR, post-pan retinal photocoagulation, burnt-out retinopathy, no maculopathy and no visual deterioration for at least one year.

Our SNEC PEC research study looking at right-siting of stable diabetic retinopathy (with or without cataract) has shown clinical decision making and clinical management by PEC physician is equivalent to gold standards of management by a specialist ophthalmologist. Patients are equally satisfied with the PEC compared to the SOC setting and the total costs of a visit to PEC were estimated to be 55.4% of a visit to SOC.

Encouraged by these results, we have upscaled our PEC concept and have trained several family medicine practitioners and institutional optometrists with a targeted approach towards management of chronic stable eye conditions. Skill transfer included history taking, clinical exam (detailed slit lamp exam, dilated fundus exam with non-contact fundus lens, IOP assessment), management and disease counselling. The team of trained PEC physician and optometrists run stable eye clinic offsite, which includes casemix of patients with

Clinical Pathway for referral of PEC patients back to D.R.S



stable DR, glaucoma and cataract. Patients are referred to a specialist clinic based on pre-defined protocols. (Fig)

IMPACT AND LEARNING

What was the impact and why did it work?

Singapore Integrated Diabetic Retinopathy Programme (SiDRP) telemedicine model, a national programme, screens for DR at the primary care level and makes appropriate referrals to tertiary centres based on the recommendations. Approximately 10% of total patients screened are referred for specialist appointment at tertiary eye clinics. Of these 6-8% cases are right sited to PEC stable DR clinic for further follow up.

Our integrated PEC model demonstrates the effectiveness and feasibility of secondary or step-down eye care models and relieve the strain on tertiary centres.

Challenges and learning

Right siting of eye care requires critical system approach and strategies that need to be strengthened such that all the stakeholders, the patient, physicians and employer perceive the benefit and comply with appropriate pathways and guidelines.

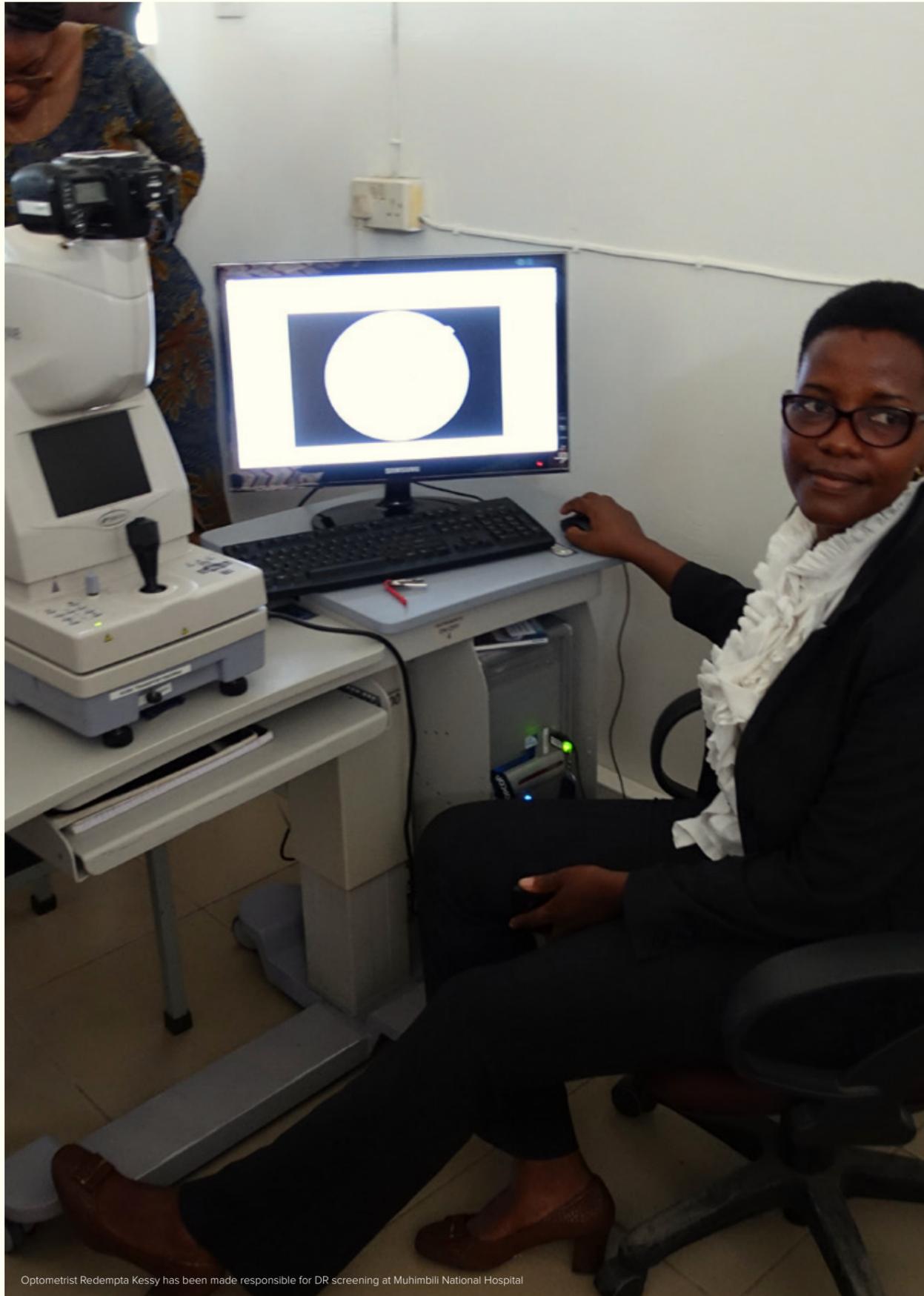
The sustainability of step down PEC is dependent on the perceived financial and practical benefits for both patients and decanting specialists. The costs differences between PEC and SOC are related to manpower and overhead cost.

In Asia, patient convictions that only the specialist doctor delivers the most appropriate care are strong. Therefore, patients are willing to pay their fee 'to see the ophthalmologist'. Task-substitution of eye care to non-doctors (e.g. optometrists, nurses) is a novel concept. Related financial and reimbursement schemes will play an important role in the successful implementation of PEC on a larger scale.

Our PEC concept might need to be more closely interwoven with the public primary polyclinics and close collaboration with private general practitioners should be explored.

CONCLUSION

Right-siting of patient and task-shifting of eye care to competent PEC trained optometrist and non-specialist physician reduced burden of managing non-complex cases from the specialists in tertiary institutions and allowed them to manage more complex cases.



Optometrist Redempta Kessy has been made responsible for DR screening at Muhimbili National Hospital

International Case Studies of Integrated Care for Diabetes and Eye Health

Upscaling of diabetic retinopathy screening in Tanzania

INTEGRATION TYPE

Integration of eye care into routine diabetes care/primary care

TARGET POPULATION

 An Adults attending the diabetic and eye clinics at Muhimbili National Hospital

SETTING

 Income Group: Low income; Region: Urban – Dar es Salaam

IMPACT

 1,638 patients screened, 815 laser treatments for DR

PROJECT BUDGET

 USD \$20,000

PROJECT TIMELINE

 November 2014 – January 2016

AUTHORS

London School of Hygiene & Tropical Medicine. Mrs Denise Mabey, Miss Marcia Zondervan, Miss Claire Walker, Dr Radhika Patel

ACKNOWLEDGEMENTS

Muhimbili University of Health & Allied Sciences, Tanzania (MUHAS) – St Thomas' Hospital, London (STH) VISION 2020 LINK, Diabetic Retinopathy Network (DR-NET) of the Queen Elizabeth Diamond Jubilee Trust. Dr Celina Mhina, Dr Faraja Chiwanga, Mr Moin Mohamed

PROJECT EXPENDITURE – PRIMARY COSTS

VISION 2020 LINKS capacity building and training

SOURCE OF FUNDING:

The Queen Elizabeth Diamond Jubilee Trust. Some small equipment provided in kind by the charity Eyehope.

ABOUT THE CASE STUDY

The problem

The scale of the epidemic of DM and diabetic retinopathy DR in Tanzania is only just becoming apparent. The adult population of Dar es Salaam is 3.6 million, with a prevalence of DM of 7.8%. One third of people with DM have DR, of whom 10% require treatment to prevent unnecessary sight loss. It is estimated that annually, 25,000 people from the population of Dar es Salaam require screening and 2,500 require treatment.

However, screening and treatment for DR are still in their infancy with Muhimbili National Hospital being the only government facility offering DR screening and treatment in Dar es Salaam. This case study provides information about the development of DR screening and treatment services at Muhimbili.

Overview of the intervention/program

The MUHAS – STH VISION 2020 LINK³⁹ was set up in 2007 with one of the key focus areas being on human resource development for medical retina. In 2014 the LINK joined the DR-NET funded by the Queen Elizabeth Diamond Jubilee Trust and started collecting monthly data on the number of screening and treatment episodes for diabetic retinopathy that occurred at MUHAS. In collaboration

³⁹ The VISION 2020 LINKS Programme works to improve quality and quantity of eye care training, mainly in Africa. The programme, which began in 2004, has so far established 21 links between training institutions in Africa and the UK. It works by matching an African eye department with a UK eye department in a partnership to train the whole eye care team. For more information on LINKS visit <http://ceh.lshtm.ac.uk/vision-2020-links-programme/>



with the Ministry of Health, the Tanzanian Diabetic Association (TDA) donated a retinal camera to the diabetic clinic at Muhimbili National Hospital (MNH), in the expectation that screening numbers would increase if the patient pathway were simplified

Intervention/program details

Redempta Kessy is an optometrist at MUHAS who has been made responsible for DR screening. She attended the opening DR-NET workshop in 2014 and has been on two subsequent LINKS training visits to STH and Gloucester to learn grading skills. She is now taking the Gloucester DRS online course.

Throughout 2015 DR screening took place only in the eye clinic. Patients seen in the diabetic clinic were given an appointment to attend the eye clinic on another day. It was recognised that many did not return for their eye screening appointment, which is on the same site but a 10-min walk from the diabetes clinic.

The retinal camera donated by the TDA was placed in the diabetic clinic at MNH in January 2016. From then on, DR screening has been performed in the diabetic clinic and on the same day as the diabetic appointment.

IMPACT AND LEARNING

What was the impact and why did it work?

The total number of patients screened for DR in 2015 was 217. Since the introduction of the camera in the diabetic clinic there has been a sustained increase in number of patients screened with 706 screened in 2016 and 715 screened in 2017. In 2015 there were 215 laser treatments, 270 in 2016 and 330 in 2017.

The project has enabled increased awareness and training for health workers in the diabetic clinic in screening and management of diabetic eye disease. There has been a marked increase in the numbers of screening episodes, especially since the installation of the camera in the diabetic clinic.

Simplification of the patient pathway with a one-stop shop approach has enabled patients at risk to be more easily identified, screened and treated.

In addition referral processes have been optimised through people being given an appointment for treatment at the time of screening.



Optometrist Redempta Kessy has been made responsible for DR screening at Muhimbili National Hospital

Challenges and learning

The setting up of a retinal camera in the diabetic clinic requires space and involvement of staff from outside the eye department and is unlikely to be successful without positive input from the diabetic doctors and nurses.

Collaboration between ophthalmologists and diabetologists at an early stage of planning is essential to foster a sense of joint ownership. Involvement of Ministry of Health in in planning and budgeting for development of DR services, allocation of staff and provision of equipment is essential.

Training opportunities in DR screening have been made available to nurses, who previously had no knowledge of the eye complications of diabetes. Shared learning from other DR-NET LINKS has been both encouraging and supportive for planning.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

- This case study demonstrates how moving diabetic retinopathy screening from the eye clinic to the diabetes clinic can, with immediate effect, triple the number of screening episodes at an urban hospital.
- The success in increasing screening episodes has encouraged the team to plan for outreach screening and four people have requested registration for further online training as DR screeners.
- Another camera has been purchased by the St Thomas' – Muhimbili LINK and the plan is for it to go out to secondary hospitals as part of an outreach programme
- A significant expansion of DR screening and treatment services is needed in Africa to address the growing need and prevent huge numbers of people losing their sight unnecessarily



Eye examination lane at Lynn Community Health Center

International Case Studies of Integrated Care for Diabetes and Eye Health

Diabetic eye health care model of integration at the inter and intraprofessional levels at a community health center in the US

INTEGRATION TYPE

Horizontal and vertical integration of services

TARGET POPULATION

 Patients with diabetes at the Lynn Community Health Centre (LCHC). Sixty four percent of the total patient population at the LCHC is at or below the US federal poverty level.

SETTING

 Income Group: High income, Region: Urban – Lynn, Massachusetts

IMPACT

 1,155 dilated diabetic eye examinations

PROJECT BUDGET

\$\$\$ N/A

PROJECT TIMELINE

 Commenced 2017 – ongoing

AUTHORS

Timothy Bossie, OD F.A.A.O, Former Director of Eye Care Services, LCHC and Assistant Professor of Clinical Optometry, The New England College of Optometry (NECO); Bina Patel OD F.A.A.O, Professor, New England College of Optometry, Director of International Programs

ACKNOWLEDGEMENTS

LCHC and NECO

PROJECT EXPENDITURE - PRIMARY COSTS

- 1) Staffing
- 2) Equipment costs

SOURCE OF FUNDING:

LCHC

ABOUT THE CASE STUDY

The problem

LCHC is a non-profit, multicultural, community health center and has grown significantly in recent years with professional services ranging from medical care, eye services, dental services, women and children health needs, nutrition programs, behavioral health, and elderly care services. The team members include highly qualified mental health therapists, nurse practitioners, physician assistants, dentists, optometrists, and pharmacists, and other specialists who work together to create a patient-centered medical home.

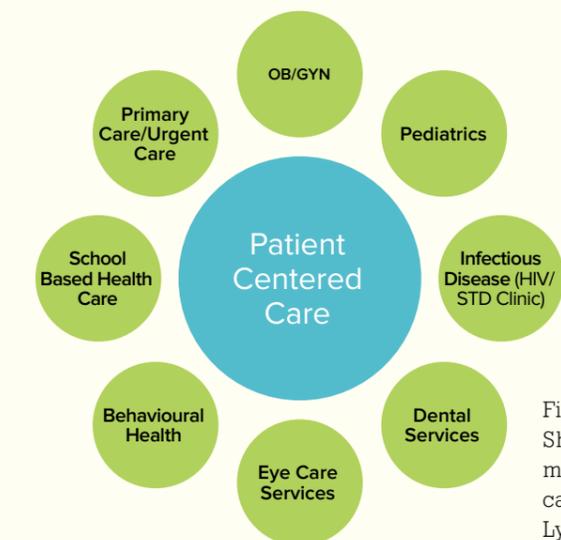


Figure 1: Showing the multidisciplinary care provided at Lynn Community Health Center.

The center uses an integrated care model offering inter and intra professional access for all patients seen at the health center. Care is coordinated among providers, with special attention paid to medical and behavioural health clinicians, who practice together in the same location.

The number of examinations provided by the eye clinic has increased year to year since its opening. There has also been a steady influx of new patients including diabetic patients needing a routine eye examination. Patients with ocular complaints or diabetes all receive a referral for Optometric services as the first entry point. Comprehensive eye examinations include dilated fundus examinations. In the fiscal year 2017 (FY2017) the LCHC eye clinic examined 8,223 patients. The clinic has struggled to ensure that all of our patients with diabetes have annual eye examinations because of the substantial growth in patient numbers.

Overview of the intervention/program

Several projects have been initiated between the eye clinic and other departments throughout the health center to improve our diabetic care. These include the following:

- Using a health maintenance application in our **electronic health records (EHR)** system. The health maintenance application, allows all providers to visualize the last eye, podiatry, and primary care examination for each person with diabetes. Specifically, eye care providers enter the date and ocular findings from their dilated eye examination. This information is easily visualized by other providers on the patient's care team.

- Streamlining the referral process. We have created a **universal referral process** for all diabetic patients. The title and information included in the referral from physicians is the same now for all diabetic patients. This has

allowed all of the health center providers to submit the standardized referral to the eye clinic referral coordinator.

- The eye clinic has created more **examination slots for patients with diabetes**. Additionally, diabetics are scheduled by our front desk staff prior to the schedule being opened for all patients. This schedule change ensures that we are able to book a significant number of our diabetic referrals. The health center stresses that diabetic patients are a high priority and this policy is also used in the eye clinic.

- The ability for the eye clinic to examine all 3,552 diabetic patients annually would be a significant challenge. The eye examination space, number of providers, and total number of appointments slots has a major role in this issue. However, with the changes to our workflow described above, we have been able to schedule more diabetic patients into the eye clinic annually.

IMPACT AND LEARNING

What was the impact and why did it work?

From March 2017 to March 2018, the LCHC eye clinic has conducted 1,155 dilated diabetic eye examinations. In the year prior with similar examinations room and staffing the eye clinic encounter approximately 875 diabetic patients. This increase in examinations demonstrates that our workflow changes have been beneficial to the diabetic population. (Reference-Lynn Community Health Center).

A major impact has been the collaboration and overall communication between primary care, behavioural health and the eye clinic. At LCHC, behavioural health providers (therapists) and primary care physicians

(medical doctors, doctors of osteopathic medicine) work together to provide collaborative care to patients. The health care professionals work together to provide the best possible interdisciplinary care to each patient examined at the health center. The use of the health maintenance application and universal referral process has made it easier for primary care physicians to refer diabetic patients. These changes have also made it easier for all health professionals involved in collaborative care to understand when the last dilated eye examination took place. The referral process for PWD was incredibly complex prior to the changes that we made. This made it difficult for providers to understand if a diabetic patient needed a dilated eye examination. Additionally, due to the significant difference in provider referrals we were unable to sometimes get diabetic patients scheduled. Routinely, specific ocular findings noted in the examination (more routinely retinal findings) are communicated to the primary care physicians to ensure the patient's overall systemic health. The future goals of the health center are to continue with this initiative to ensure that a majority of the diabetic population in Lynn, MA is receiving annual diabetic eye examinations. Data run in the spring revealed that the eye clinic was currently screening about ~30% of the diabetic population at the health center with a long term goal being set closer to 50%. In addition, the health center has been discussing the idea of tele-retinal health screenings conducted in the primary care department. Tele-retinal medicine could further the effort involving annual retinal screenings while also ensuring that patients

with more advanced diabetic retinopathy receive care or referrals sooner.

Challenges and learning

Some of the challenges and lessons we have learned at LCHC include

- The primary care physician's (PCP) understanding the importance of annual eye examinations along with how to properly process an internal referral to the eye clinic.

- Data acquiring process in the EHR system regarding patient "health maintenance." This was a challenge to get all providers and staff encountering the patient to ensure that the proper information was completed.

- Finding ways to adjust the eye clinic schedule in order to schedule more diabetic patients for examination.

- Communication about the importance of annual eye examinations, examination findings, and/or follow ups with patients from various ethnic backgrounds. Handouts and educational materials regarding diabetic eye care were dispensed to patients in Spanish. If the patients were able to read and write educational materials from the electronic health record system were dispensed to the patient.

- Booking issues: Originally, the eye clinic presumed that all patients were being referred to the eye clinic for evaluation following an examination by their primary care physician.



Front reception at Lynn Community Health Center

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

This case study is an important demonstration of how improving integrated care for diabetes and ocular health is critical for the patient's health. It shows the focus at LCHC and its overall success, is based on prioritizing the patient and making them the center of care.

In conclusion, improved communication between patient's integrated care providers has been critical. We improved the understanding or importance of annual eye examinations to provider and the community health center patients. Most importantly, we increased the number of PWD receiving annual ocular care in the eye clinic. In FY 2017, LCHC eye clinic has conducted 1,155 dilated diabetic eye examinations. In the year prior with similar examinations room and staffing the eye clinic encounter approximately 875 diabetic patients. This increase in examinations demonstrates that our workflow changes have been beneficial to the diabetic population. (Reference-Lynn Community Health Center).

Diabetic retinopathy screening and treatment in Zambia

INTEGRATION TYPE

Integration of DR policies, guidelines and training into all relevant national health policies, and guidelines

TARGET POPULATION

 Adults with diabetes mellitus living in Zambia

SETTING

 Income Group: Lower middle income; Region: Urban – Kitwe

IMPACT

 Incorporation of DR into Zambia's National Health Strategic Plan 2017-2021

PROJECT BUDGET

 USD \$630,000

PROJECT TIMELINE

 Initial partnership commenced in 2011.

Project has since been scaled up across Zambia and is continuing

AUTHORS

Frimley Park Hospital, Frimley, UK

ACKNOWLEDGEMENTS

Kitwe Central Hospital, Zambia; VISION 2020 LINKS Programme, International Centre for Eye Health, London School of Hygiene & Tropical Medicine

PROJECT EXPENDITURE – PRIMARY COSTS

- 1) Annual training costs including international support and experts
- 2) Equipment costs for five hospitals in Zambia

SOURCE OF FUNDING:

Zambian Ministry of Health, Tropical Health Education Trust (THET), The Queen Elizabeth Diamond Jubilee Trust, Christian Blind Mission, Konkola Private Hospital, Chingola

ABOUT THE CASE STUDY

The problem

With a per capita gross domestic product (GDP) of around US\$1,700, Zambia is now a lower middle-income country (LMIC). Large portions of the population, however, have not shared in the overall improvement in national prosperity seen in recent years. 60% of the population live in rural areas and depend on subsistence farming. Lack of access to quality health care services is a major problem faced by poor, rural communities.

Improved health outcomes are constrained by poor quality health and medical services; non-availability of medicines, equipment and supplies; shortages of skilled human resources, especially in rural areas; and by social determinants of health such as low income, gender inequality, lack of information and access to services.

In 2011, Frimley Park Hospital Eye Unit began working with the Kitwe Central Hospital Eye Unit in Zambia as part of the International Centre for Eye Health's VISION 2020 LINKS Programme. A scoping visit carried out in 2011 revealed that a major problem in Zambia was the absence of a

diabetic retinopathy screening and treatment programme, which meant that patients with diabetic eye disease inevitably presented very late, often at an untreatable stage.

Data from the IDF Atlas show that there are 8.2 million adults in Zambia. The age-adjusted prevalence of DM amongst this population is 3.7%. There are therefore 228,000 adults with DM in Zambia. People with DM need an annual eye examination to identify changes indicative of diabetic retinopathy (DR), a sight-threatening side effect of DM. Each year, 228,000 adults in Zambia need to be screened for DR.

In LMICs, it is generally accepted that 35% of adults with DM have signs of diabetic retinopathy (DR). 10% of adults with DM will already have vision-threatening DR, which needs immediate treatment. This means that in Zambia 80,000 people have a measureable degree of DR and, of them, 23,000 need urgent treatment in order to preserve their remaining sight and prevent unnecessary blindness.

Overview of the intervention/program (i.e. objectives, hypothesis or what did the program set out to achieve etc.):

The key objectives of the project were:

- Annual retinal screening to be offered to adults with diabetes
- Screening using digital retinal photographs
- People identified as having potentially sight-threatening retinopathy to have access to specialist assessment and treatment
- National framework and guidelines for diabetic retinopathy (DR) services across Zambia

Intervention/program details

The intervention was to initiate and develop diabetic retinopathy services in Zambia.

Multidisciplinary teams from Kitwe and Frimley Park worked together through their VISION 2020 LINK to develop and implement a DR screening and treatment programme in the Copperbelt province for the first time in Zambia.

In order to identify PWD in the Copperbelt, lists of people receiving treatment for DM were obtained from pharmacies and checked against lists of people already being screened for DR at Kitwe Central Hospital.

Outreach screening was promoted via radio, TV, billboards and in churches, stating where and when the outreach clinic would be held. These community DR screening sessions were promoted in advance in places where people who might traditionally have reduced access to eye care services – especially women – could be reached.

Screening using a portable retinal camera took place in five community hospitals – secondary centres – all over the Copperbelt. As well as nurses, hospital-based health workers known as Patient Aids were trained to screen patients with the retinal camera; some were also trained to grade the resulting images. In this regard, the use of competency-based training enabled a relatively low cadre of health workers to be effective, accurate screeners and graders. This ensured that the workload of DR screening was not all done by nurses, freeing them to do nursing tasks.

As part of the outreach session, nurses trained in counselling talked to the patients about DM, DR and the need for systemic control of their DM. Those needing referral to an ophthalmologist for treatment were given

an appointment at Kitwe Central Hospital. A list was kept of patients who did not attend, so that they could be targeted when they next appeared in the local health system.

The funding for the screening programme was obtained partly from the Ministry of Health and partly from the Konkola private hospital. As part of the project, screener/ graders from Konkola hospital were trained.

The training of health workers in screening and treating PWD for DR is now being expanded to hospitals in all the 10 provinces of Zambia.

Through the LINK, the Frimley team provided the expertise to develop DR screening, and trained (and continues to train) staff at all levels to capture high quality retinal images and to grade them and know when and with what urgency to refer patients for treatment to preserve their sight.

Through the LINK, the Frimley team provided additional laser expertise, and trained (and continues to train) ophthalmologists and residents in laser treatment of DR.

Through the DR-NET the Zambia-Frimley teams are working alongside teams from eight other countries in Africa to share learning for development of DR services and preparation of national frameworks and guidelines (Kenya, Tanzania, Uganda, Nigeria, Ghana, Malawi, Zambia, Botswana).

IMPACT AND LEARNING

What was the impact and why did it work?

- Implementation of a DR service that is the first of its kind in Zambia
- Incorporation of DR into Zambia's National

Health Strategic Plan 2017-2021

■ The success of the screening project in Kitwe has enabled the LINK to expand screening services across Zambia and now covers other provinces including Lusaka and Southern province and is being rolled out countrywide

■ Establishment of a competency-based training programme for the DR service using a multi-disciplinary team approach with a mix of hands-on classroom and clinical teaching in Zambia. This educational programme is now being introduced in Kenya, Tanzania and Malawi.

■ An innovative approach within the DR service was the screening results given following consultation through a nurse-led counselling service.

Challenges and learning:

Retinal cameras and lasers were not routinely available in Zambia. During the LINK training project, Kitwe Central Hospital was able to procure a retinal camera with the help of funding from Christian Blind Mission. Kitwe already had a laser.

The Zambian government noticed the success of the screening programme in the Copperbelt and there was significant investment by the Ministry of Health in the DR service infrastructure across Zambia. There are now cameras, lasers and Optical Coherence Tomography machines in five of the ten provinces at a total cost of about USD \$250,000 for the Zambian Government.

Research focusing on the prevalence of diabetes in the Copperbelt and exploring factors contributing to its development in this mixed urban and rural population in Zambia has been published in Eye journal. The findings showed that 2,600 patients



were screened in a year; 52% of patients had evidence of DR and over a third of patients had sight-threatening DR⁴⁰.

CONCLUSION

Why is this case study important for improving integrated care for diabetes and eye health?:

This approach developed in Zambia is important because it demonstrates a range of strategies that can be utilised to achieve integration. In particular it shows:

- How links between eye specialists and diabetologists can be strengthened
- How links can be strengthened with PWD through third parties such as pharmacies, where lists of people receiving treatment for DM are held; and with diabetes specialists in Kitwe Central Hospital and other tertiary hospitals throughout Zambia

(<http://www.diabetesatlas.org/across-the-globe.html>)

(Yau et al *Global Prevalence and Major risk factors of Diabetic Retinopathy Diabetes Care* 35:556-564, 2012)

- That taking eye care to the patients is of critical importance and that its effectiveness can be enhanced by taking a portable retinal camera out into the community and arranging community-based eye screening sessions

- The importance of promoting screening sessions in advance in places where people who might traditionally have reduced access to eye care services – especially women – can be reached, such as churches

- Using a counsellor to explain to patients the risk that DM presents to their sight and the need to attend annual screening is important in enabling patients to have a better understanding of their condition

- The Ministry of Health has a greater understanding of the needs of DM patients for DR services and gives a high priority to delivering DR services nationwide thanks to an evidence based approach

⁴⁰ Adam D. Lewis, Ruth E. Hogg, Manju Chandran, Lillian Musonda, Lorraine North, Usha Chakravarthy, Sobha Sivaprasad & Geeta Menon, 'Prevalence of diabetic retinopathy and visual impairment in patients with diabetes mellitus in Zambia through the implementation of a mobile diabetic retinopathy screening project in the Copperbelt province: a cross-sectional study', Eye, The Royal College of Ophthalmologists, 2018 (<http://www.diabetesatlas.org/across-the-globe.html>)

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**The Fred Hollows
Foundation**

www.hollows.org